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ABSTRACT

Proposals for calculating unit costs are advocated that are based on a body of methods common to the member universities. Production inputs and cost components in French universities are studied in terms of resources at the disposal of the university, and staffing, capital, operating, and transfer costs. Identification of activities and calculation of activity costs is reviewed with consideration given to elementary units of activity (UEA) and cost centers, UEA activity indicators, accounting procedures for aggregate costs, and unit activity costs. Output costs are determined with regard to teaching, research, public service, and accessory outputs, student flow, and averaging methods. An approach to budget control is outlined, emphasizing ex-ante activity costs and determination of UEA cost functions. A glossary of terms is included. (LBH)

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PROGRAMME ON INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION

METHODS OF CALCULATING COST IN FRENCH UNIVERSITIES

technical report

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PROGRAMME ON INSTITUTIONAL MANAGEMENT IN HIGHER EDUCATION

METHODS OF CALCULATING UNIT ACTIVITY AND OUTPUT COSTS IN FRENCH UNIVERSITIES

by

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SECOND GENERAL CONFERENCE OF MEMBER INSTITUTIONS

(Paris, 20th-22nd January, 1975)

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(*) Translator's note: As this report refers to specifically French concepts, their French initials will be retained throughout the English version.

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(*) UER: Unités d'Enseignement et de Recherche - Units of Education and Research.

(**) UEAE - Unité Elementaire d'Activité d'Enseignement - Elementary Unit of Teaching Activity.

NOTE BY THE SECRETARIAT

As the urge to improve collective living standards has steadily developed throughout O.E.C.D. countries in the last 20 years institutions of higher education have had to switch at short notice from a situation in which they provided training for an elite to a situation in which they are called upon to meet the needs and aspirations of a rapidly growing student population from widely varying backgrounds. Universities and other post-secondary institutions have therefore had to accept new objectives and roles which are uneasily poised between the scientific, cultural and pedagogical functions of higher education and research. This trend was bound to involve thorny problems for those whose responsibility it is to plan and control university development. The task of bringing the objectives of the university, with all the resources it has been assigned to discharge its traditional functions, into line with the functions arising from its new vocations is fraught with difficulties. All aspects of planning and institutional management in higher education have therefore become vitally important and have resulted in investigations and studies whose novelty and originality cannot be over-emphasized. But hardly has the university begun to become aware of its new vocations and responsibilities, at least in Europe, when it has had to face a slowdown in the demand for higher education accompanied by increasingly severe criticism of its functions in the community and a stagnation in the flow of national resources allocated to teaching and research. The convergence of these new developments has necessitated further intensive thinking and further efforts to devise new methods of management.

From its inception, the O.E.C.D.-CERI Programme on institutional management in higher education has focussed on the solution of problems which undeniably arise from the fact that universities and other institutions were often ill-prepared for the task of managing the resources made available to them with the maximum efficiency. In its first stage (1969-1971) the Programme set itself the task of showing how these institutions might learn to manage their resources more effectively by improving their decision-making procedures with particular regard to information systems, financial administration; the analysis of student flows, the use of premises, the organisation of curricula and syllabuses, etc.

The Programme's initial objectives were achieved in the first instance through the specific studies and research conducted by the CERI Secretariat and subsequently by the investigations carried out by 8 universities - one in Denmark, France, Germany, the Netherlands, Sweden and Yugoslavia and two in the United Kingdom - which devoted their attention to one or more of the above problems. This task of exploration mobilised some 52 specialists and cost F.Frs.1,700,000 of which over three-quarters were financed by the national authorities of the countries participating. Most of this work has been published by the O.E.C.D. in the collection "Studies in Institutional management in Higher Education".

An evaluation of the work done in the first phase of the Programme was the main subject of a Conference organised in November 1971 which was attended by 192 participants from 21 O.E.C.D. countries representing the universities, the government ments concerned and the main international bodies. Expressing the hope that this activity would be pursued, the Conference considered it advisable that:

(i) CERI should develop its functions in the field of information, co-ordination and training in university management and planning;

(ii) CERI should promote all activities likely to foster broader inter-institutional co-operation in research and investigation.

These discussions and recommendations led to the second phase of the CERI Programme on institutional management in higher education which is now characterised by the active participation of a large number of institutions of higher education (over 100) and particularly by an appreciable increase in the number of multi-institutional and multidisciplinary research groups working on subjects of joint interest. In short, although the general objectives of the Programme are the same as those which brought it into being, the experience acquired in the last few years has enabled it to improve its methods of work and adapt them more effectively to the requirements of its member institutions.

Since the initiation of the second stage of its activities, the Programme Secretariat, in co-operation with the national universities and authorities concerned, has endeavoured, to encourage the establishment of research groups. For this purpose, a list of priority subjects for research and investigation on various aspects of management was drawn up with the assistance of a special group of experts and circulated to the institutions concerned. Those which then decided to join the programme were thus able to express their preference as to the types of investigation in which they wished to participate. In practice, certain of the proposed subjects aroused the simultaneous interest of several institutions with the result that the latter formed a number of groups which were able to approach the problems not only more comprehensively but also in greater depth than a single isolated institution could have done. Three groups(1) were set up between the end of 1972 and the beginning of 1973 for periods of one to two years and it is their final reports which are now submitted for the attention of the participants in this Conference.

In accordance with the general principles stated above, the Programme Secretariat invited seven French universities (Dijon, Grenoble II, Paris I-Panthéon-Sorbonne, Paris IX-Dauphine, Paris X-Nanterre, Toulouse-le-Mirail, Toulouse-Paul Sabatier) which had expressed a common interest in cost accounting methods and budget control procedures to submit plans for studies on this subject. After several co-ordinating meetings in 1972, this group which was subsequently joined by the Catholic University of Louvain, the University of Liège (Belgium) and the University of Fribourg (Switzerland) began, in January 1973, to work out a system for the collection and processing of data required for the evaluation of the global and unit economic costs of university activities in connection with teaching, administration and even research.

The teams which were set up by the seven French universities concerned first reached agreement on the principals of a joint method for calculating various types of costs and subsequently carried out a number of calculations specific to certain sectors of university activity.

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(1) - Research group n° 1: "Measuring student success: a systematic statistical analysis" (co-operation between two Austrian universities).

- Research group n° 2: "Budget control procedures and methods for calculating unit costs of activities and outputs of higher educational institutions" (co-operation between 10 French, Belgian and Swiss universities).

- Research group n° 3: "Study of the comparative effectiveness of university administrative structures" (co-operation between 20 universities).

The present paper(1) outlines a "method of calculating unit activity and output costs in French universities". Its authors who were commissioned by the Group as a whole, are Mr. A. Babeau, Mr. C. Cossu and Mr. S. Cuénin. We are convinced that the efforts that they have made to achieve a clear presentation of the elements of an operational cost accounting system adapted to the particular type of organisation represented by institutions of higher education will prove of great service to all who are anxious to pursue investigations in this field.

The Centre for Educational Research and Innovation (CERI) wishes to thank the authors of the present Report and all the leaders and members of the teams set up by each of the universities which has participated in the project. In the course of the 15 or so working sessions which they attended throughout their 18 months of co-operation they have undoubtedly contributed, by their criticisms, comments and suggestions, to improve the initial versions of this methodological Report. Our gratitude is also due to the Presidents of the universities mentioned above for the aid and support that they have unfailingly afforded to the CERI Programme on Institutional Management in Higher Education and the teams which were set up in their institutions. We likewise wish to extend our thanks to Professor Abraham-Frois who has co-ordinated the activities of the French-speaking group.

The necessary resources for the financing of all the work done by the French universities was allocated to them by:

- the French Ministry of Education,
- the Société Shell-Française, in the form of a donation to CERI.

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(1) The results of the practical application of the joint method developed by the French universities, the results of parallel investigations conducted by French-speaking institutions participating in the Group's work and a tentative synthesis of all these projects are being published separately.

INTRODUCTION

The present report is the result of a study assigned to André BABEAU, Claude COSSU and Serge CUENIN at the meeting of the OECD-CERI French-speaking group at Grenoble on 4th and 5th May, 1973. The authors were not given "carte blanche" but simply delegated to make proposals for ways of calculating unit costs of activities and outputs, using a body of methods common to the universities which are members of the group. A first draft of the report was discussed by the whole French-speaking Group at a meeting in Toulouse on 20th and 21st September, 1973. As a result of these discussions, the draft was amended on a number of points, particularly to simplify somewhat the methods proposed. The report submitted here is therefore the revised version: revised but not final, since the reader will soon perceive its incompleteness with regard to:

- the theoretical development of the choices implicitly or explicitly made;
- the practical development of the methods proposed so as to make them immediately usable by each of the establishments participating in the Group's work.

(1) From the theoretical standpoint, it is not possible to speak of a cost function in the strictest sense unless the production function of the university has first been explained. But although mention is indeed made of inputs and outputs, nowhere in the report is the form of the chosen production function actually specified. This deficiency has at least two consequences: for one thing, it leaves the way open to a strict application of the production theory to French universities (and probably not only French universities); for another, the costs determined by the methods proposed are "apparent" costs that are empirically calculated and certainly not obtained by a process of optimisation at a particular level.

In fact, quite apart from this problem of the production function, it will be seen in nearly every chapter that the proposals put forward need to be supplemented by as many lengthy annexes, which would provide further matter for reflection and might reveal other solutions.

(2) From the practical standpoint, in spite of the wish expressed by the members of the Group, it was not possible to go into minute detail in every situation. The situations are in fact too diverse and not enough is known about them yet. The enactment of the 1968 Loi d'Orientation in France had the effect of accentuating a twofold differentiation in university structure and the structure of studies. Where university structure is concerned, the decentralisation of management at the level of Units of Education and Research (UERs) is by no means the same in all universities. With regard to studies, the same UER will have degree courses with a credit structure alongside courses with a year structure. For these reasons, an exhaustive and detailed description of a standard university in which everyone would recognise his own establishment was, in the present state of our knowledge, all but impossible. Our first endeavour was therefore to make the proposals adaptable to every possible situation. But the actual adapting still has to be done; this fact must be faced. The hope may be ventured that the work of adaptation will not take too long and that it will be done with some homogeneity

of approach, which must surely be a prerequisite for the work of the French-speaking Study Group.

The report comprises 12 chapters. Chapter 1 discusses the general approach taken by the study and the remaining chapters are grouped into four parts:

- Part I: Production inputs and cost components in French universities.
- Part II: Identification of activities and calculation of activity costs.
- Part III: Calculation of output costs.
- Part IV: The first elements of budget control.

Lastly, it was thought advisable to end the report with a glossary of terms used.

CHAPTER 1

AIMS AND GENERAL APPROACHES OF THE STUDY ON CALCULATION OF UNIT COSTS IN FRENCH UNIVERSITIES

The study of unit costs in French universities has to be seen against the background of all the work done abroad on higher education costs under the leadership of the OECD-CERI experts. It also has to be placed in the general context of the efforts made in France for some years now to introduce the Planning, Programming and Budgeting System (PPBS). Even if the present report does not take the form of a conventional cost-efficiency or cost-benefit analysis it will nevertheless be seen that some of the concepts proposed are fairly close to the concepts of input and output indicators used in budget programming.

More specifically, the approach proposed in the chapters that follow may be likened to the outlook adopted by the Public Accounts Directorate of the French Ministry for Economic and Financial Affairs in regard to the calculation of costs and the introduction of cost accounting into public administration. In a wider context, the aim is to put forward ideas for consideration with a view to the use of economic calculation in the broad sense in higher education establishments and throughout the university sector of the national education system.

The suggested approach of starting out from the smallest "units of production of education" is a micro-economic one: the use of certain business accounting methods, like the use of certain concepts of activity analysis, will leave no doubt in the reader's mind on this score. But what is actually involved is public sector micro-economics: in some cases, therefore, different methods of calculating cost components will be proposed according to whether the framework of reference is the relatively narrow one of the university or the Ministry of Education, the broader area of the central government and its budget, or the overall context of the nation.

In view of the studies carried out abroad on the same subject, it may be asked whether the French research group could not quite simply have adapted the methodology used elsewhere to the case of the French universities. In fact the radical differences in university structures and functioning from one country to another would alone suffice to preclude a simple transposition of methods irrespective of the specific nature of the educational establishments in the country concerned. The next drawback in this connection is that cost calculation implies a certain number of options which have a considerable influence on the significance attached to the results obtained and which the reader may prefer not to adopt. Last but not least, the detailed documents relating to the calculation of costs in foreign universities came to hand very late, so that in most cases the similarity of outlook and the convergence (or divergence) of solutions to a given problem were only established retrospectively.

Before describing the specific approach adopted in the French study and reviewing the aims it sets out to achieve, it is however, interesting to take a quick look at the work done abroad in this field.

1.1 Earlier studies on unit costs in higher education

With the exception of certain studies carried out in all too small a number of French universities(1), it is chiefly in Great Britain, Australia, Canada and the United States that work on university costs at micro-economic level has developed over the past few years. For a chronological account and a more theoretical overview of cost studies in higher education, the reader is referred to the paper written by D.R. Witmer of the University of Wisconsin(2).

The papers which we were able to examine in detail were the following, listed here in their order of publication:

- Committee of Presidents of the University of Ontario

  "A Method for Developing Unit Cost in Educational Programmes."
  C.P.U.O. - Report No. 70-3, December 1970.

- National Center for Higher Education Management Systems (NCHEMS) at WICHE

  "Cost Finding - Principles and Procedures," November, 1971.

- University of Copenhagen

  "Decision, Planning and Budgeting," OECD-CERI, 1972.

- National Center for Higher Education Management Systems (NCHEMS) at WICHE

  "Program Classification Structure," 1972.

- Office of Institutional Research

  "Companion to the University of Calgary Response to the Report of the Commission on Educational Planning," October, 1972.

- University of Bradford

  "Costs and Potential Economies." OECD-CERI, 1972.

- Western Australian Institute of Technology, South Bentley, Australia

  "A Model for the Analysis of Historical Costs and a Model of Simulation for the Production of Alternative Triennial Plans," 1972.

- NCHEMS - California State University

  "Implementation of NCHEMS Planning and Management Tools at California State University, Fullerton," August 1972.

- P. LAYARD and D. VERRY

  "Cost Functions for Teaching and Research in Universities,"
  2nd January, 1973.

1.1.1 Aims of the studies and type of cost chosen

In early attempts at calculating university costs all that was often done was to divide a university's total operating expenditure by the number of students at that university. This calculation was done without any carefully determined plan and the result was virtually unusable. The recent costing exercises have had much more specific aims.

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(1) "Les coûts unitaires dans l'enseignement supérieur: l'exemple de l'Université de Dijon", IREDU - Dijon, 1973.

(2) "Cost Studies in Higher Education", Review of Educational Research, Winter 1972, Volume 42, No. 1.

For example, the research done by the Ontario universities relates to unit costs per full-time equivalent student in the various engineering "programmes". The cost is calculated for each year of the "programme" and should show the impact of the different decision variables, as for instance:

- teachers' salaries;
- definition of the service performed by teachers;
- number of course hours per student;
- average size of classes;
- university overheads, etc.

The research done by the University of Calgary and by the University of Alberta, was designed to compare costs per student in the different study "programmes" (Fine Arts, Management, Engineering, etc.). The Canadian provincial governments in fact subsidise the universities on the basis of the number of student enrolments weighted by coefficients that are supposed to represent the cost of the various degree courses. The problem was therefore to test the validity of these coefficients.

The University of Bradford study calculates unit costs per student in the various first-cycle (undergraduate) "programmes" and courses. Emphasis is placed on the savings that can be made in teaching through a more rational use of the university's facilities.

At the Western Australian Institute of Technology the approach appears fairly similar to those of the University of Bradford in that a model of analysis of historical costs has led to a substantial improvement in the utilisation of premises and has made it possible, on the basis of enrolment forecasts, to determine the physical resources that will be necessary.

The purpose of the handbook put out by WICHE is to standardize unit cost calculations so as to permit comparisons in respect of place and time. The costs calculated relate to the different subjects taught at a number of levels (e.g. Lower Division Physics), students and student/hours in the various disciplines, and lastly graduates by type of degree. As applied to the California State University at Fullerton, for instance, these costs are used at a second stage in working out a medium-term planning schedule.

Finally, the study by LAYARD and VERRY is based on a cross-section analysis of current "outputs" and costs in United Kingdom universities (other than Oxford and Cambridge) for the 1968-69 academic year. It has the originality of using an aggregate index of production obtained by weighting the number of graduates and drop-outs by their respective salaries on the market. In working out the cost functions emphasis is placed on the existence of economies of scale and on the calculation of marginal costs of graduates, as distinct from marginal costs of research.

Although the objectives of the above studies may seem different, the various problems they represent are therefore in fact closely interlinked:

- determining the optimum size of higher education establishments;
- making better use of available resources and hence introducing efficient management machinery;
- making provision for essential facilities for accommodating a given number of students in the future, and therefore assigning variable co-efficients to subsidise according to the student's discipline.

1.1.2 Methods used

It is obviously impossible to consider in detail all the methods used, which incidentally overlap fairly considerably in a number of areas. The following comments therefore merely emphasize the specific nature of the choices made.

(a) The concept of opportunity cost which is so important in an economic approach to calculating university costs, seems to have been unevenly used. The two major types of opportunity cost to be considered in a study of this kind are, on the one hand, the cost of the sacrifice implied by the fact that students choose to continue their studies instead of seeking employment on completion of their secondary education (sacrifice of potential earnings by the students, loss to the state of corresponding income tax revenue) and, on the other, the cost implied by the university's use of its capital assets. This cost which appears seldom takes either the form of an interest on the value of the capital used or the form of a "rent". Both aspects are discarded from the method advocated by WICHE (op. cit. pp. 12 and 13). The Bradford method incorporates the second aspect but not the first (op. cit. p. 34). The same would seem to have been the case with the Western Australian Institute of Technology, which provides for an annual "charge" for buildings and equipment equal to 10 per cent of their total value without stating how this percentage was arrived at (op. cit. pp. 150 and 151). Other studies (Fullerton) conform to the guidelines of the WICHE handbook and do not allow for the opportunity cost. Layard and Verry use no data on capital inputs (land, buildings, equipment).

(b) The methods of allocating "indirect" or "semi-direct" costs, i.e., the costs of administrative activities and of service activities (see Chapter 4 for a more precise definition of these activities) differ appreciably from one study to another. In the cost study on engineering teaching in the province of Ontario, the "overhead costs" are apportioned evenly over all the students (op. cit. p. 24). The WICHE handbook, however, proposes rather precise distribution criteria, e.g.:

- for maintenance, caretaking and depreciation of buildings and equipment: the number of sq. m of floor space used;
- for the printing and copying shop: the real or estimated use of the shop by the departments;
- for postal and telephone charges, etc.: the total number of full-time employees.

Most of the studies do not on the whole go as far in their breakdown as WICHE would have advocated: in many cases the essential information is lacking.

(c) The transition from costs per student or per student/hour (class-hour, contact hour) in a particular subject or department to unit costs of graduates seems particularly difficult to make. It requires information on student flows up to the time of graduation and on the costs over the different years concerned. This means that there is no alternative but to make a time-series analysis with all the problems posed by discounting costs to allow for monetary depreciation. The calculation of unit costs or graduates on the basis of cross-section analyses necessitates numerous assumptions involving a number of debatable approximations. However, as a very last resort, this calculation has to be used. The studies concerned use the first method, as far as possible, but some of them stick to costs per subject and department and do not really go as far as output costs.

1.2 Aims of the study on French universities

A great many questions are being asked about the university sector of the French education system. Is the tendency to lengthen the duration of studies before taking up employment really beneficial to students and to the nation? Does the nation's expenditure on higher education really pay? Are the outputs of this education worth what they cost? Which is more advantageous: to produce more graduates, to combat pollution more effectively or to increase the number of low-cost housing units?

It is certain that the results of the present study will not furnish a direct answer to these questions, on which other research has been done(1), but they are likely to provide food for thought in regard to the ex-post costs of university "outputs" and the introduction of budget control machinery.

1.2.1 Retrospective unit costs of university activities and outputs

The unit costs calculated will in most cases be *average costs*. But on the basis of a detailed study of the structure of total costs, it should be possible to think of calculating certain "marginal" costs (or variable unit costs) such as the cost of accepting an additional student in a "credit" (period of study in an approved subject counting towards a degree), cost of opening a new "credit", and so forth.

It is important not to make any mistake about the significance of these costs. In the first place they are *positive* costs and not, at this stage of our work, *normative* costs. A study on normative costs would require, among other things, research on the average "quality" of outputs (e.g. level and extent of knowledge of the holder of a master's degree in business management) and on the efficiency of the teaching methods used (e.g. formal lectures in an amphitheatre as opposed to lectures on closed-circuit television). Thus, from differences in the average cost of a master's degree in mathematics in two universities it cannot be inferred that there is spoilage in the "more expensive" university, for it may be that its "output" is of better quality.

Within the *positive* costs category itself, the unit costs of a university cannot be equated with production costs in an industrial process, for example. In the university context, it is more a question of "consumption of appropriations" than of costs in the strict sense of the term: in other words, every additional resource (in teachers, in capital) granted to the university is automatically "consumed" and will therefore be debited to various "cost" items under the allocation process. The result, given the importance of government appropriations to the functioning of French universities, is that many "cost" differences revealed in the present study are little more than a reflection of the rules of resource allocation applied by the Ministry of Education (e.g. higher weighting factor assigned to science students than to law students in the state subsidy to operating costs).

Treating these *average appropriations* as the *objective costs* of the different outputs and using these costs to determine the future distribution of resources among universities, would therefore mean perpetuating a situation which may well seem questionable in the present instance. Our study does not purport to be a substitute for other investigations of the kind now being conducted by the Conference of University Presidents or by the Comité National de l'Enseignement Supérieur et de la Recherche (CNESER).

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(1) J. Benard: "Un modèle d'affectation optimale des ressources entre l'économie et le système éducatif", CEPREL Bulletin, July 1966.

While bearing in mind their real significance, it is possible, however, to use the results expected from this study for a revealing analysis of the causes of the divergences between the different costs. For instance, is the higher cost per student of a computer science credit compared with the cost per student of an international law credit in the same university due solely to differences in teaching methods (use of a computer or of specialist staff) or is it due to other factors such as the respective number of students in the two credits, the use of premises with very different floor space, substantial differences in the salaries of the senior teaching staff, and so forth? Between two universities, do different costs for the same degree reflect charges specific to one university (campus area or others), different age structures in the teaching staffs, or wide discrepancies in the pass ratios in the various credits of the degree course?

These cost comparisons should therefore above all enable the authorities of the university or Unit of Education and Research (UER) to realise the cost impact of the specific characteristics of their establishment and its various activities. It is probable that certain instances of inefficient resource allocation in the university will already become apparent at this stage, for example:

- co-existence of over-occupied and under-occupied premises;
- first and second cycle credits opened with an insufficient number of students;
- unduly high cost of certain service activities, whereas others are inadequately financed;
- insufficiently co-ordinated use of facilities and equipment as between different UERs or research teams.

1.2.2 Programme budgets and budget control

A second aim of the French study is the progressive establishment of budget control in universities. This is of course a much longer-term objective than those referred to in the previous paragraph.

Where operating budgets are concerned(1), French universities are administered in very different ways. Some universities are little more than ex-faculties juxtaposed which in fact have kept their former budgets almost intact (operating subsidy, additional hours, overall appropriation for research, etc.): the joint services of such universities are therefore reduced to their simplest form. Other universities, however (e.g. those with a single location), have a centralised management and their joint services budget covers expenditures directly connected with UERs (postal and telephone charges etc., maintenance of buildings, caretaking, heating, lighting, etc.). In either case, the supervision of expenditure may be inadequate, with the result that there are often setbacks in the execution of one operation or another.

The overall management of expenditure would naturally be more effective if the university had a structure of programmes with an underlying structure of objectives. It is hardly an exaggeration to say that the practice at present is to do roughly the same thing as before at the conclusion of a procedure which smacks much more of a "free for all" than reasoned discussion. And the manner in which allocations are utilised often leads to haphazard commitments having no direct link with any clearly specified objectives.

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(1) The situations differ widely but it may be estimated that the operating budgets of the universities represent between one-fifth and one-fourth of the resources put at their disposal each year by the government.

The establishment of programme budgets should enable the expenditure financed from university budgets to be more effectively discussed and more efficiently distributed. The role of the budget with its conventional classification of charges is becoming increasingly inadequate at a time when the budget of a large university runs to well over Frs.10 million: a more functional presentation has become essential. Furthermore, budget implementation on the basis of programme budgets in which funds were granted for specific objectives might involve a quarterly verification of expenditure. Analysis of the discrepancies between forecasts and final figures (in respect of quantities and prices) might show how programmes could be satisfactorily completed, for instance by adjusting certain targets and/or granting further resources.

Without underestimating the difficulties involved in drawing up these programme budgets, we have set out a number of considerations in Chapters 11 and 12 on how to calculate the costs used in budget control.

It would of course be desirable to be able to incorporate these programme budgets into a multi-annual plan for the universities. But although the need for such planning is already clearly felt by the authorities of institutions of higher education, the means (enrolment forecasts, trend in subsidies) are often lacking.

1.3 Main methodological approaches used in the study

In the context of systems analysis, the university may be regarded as a production system(1) the complexity of which derives mainly from the fact that the outputs are often difficult to identify and some of them are particularly hard to quantify. It is a system of "limited rationality" in that it does not appear to obey a set of objective rules aimed at maximising a utility function. It is also a system with very slight co-ordination between activities: there is practically no communication between many of the sub-systems. The result is that each sub-system tends to organise itself at a level of operation that is satisfactory locally but without taking into account the objectives of the overall system, which are often very difficult to discern.

The study of costs should be the occasion for defining the objectives of the system more clearly and showing up the inter-relationships between the different sub-systems, which are often ill-perceived.

1.3.1 Identification of final outputs and intermediate outputs

A "final output" is any "product delivered to the outside". However, whether the output is final or intermediate depends on the level chosen:

- Elementary unit of activity (UEA);
- Unit of Education and Research (UER);
- University;
- Educational system.

For example, a student having obtained a "credit" (elementary unit of educational activity) and remaining in the same UER will be regarded as a "final output" at the level of the UEA but as an intermediate product at the other levels. In the rest of this report the final or intermediate nature of an output will depend on the level of the university concerned. Thus, the computing hours spent by a UER of the university in its computing centre constitute an intermediate output; but if they are supplied

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(1) See N. Communod: "Une méthodologie d'analyse pour le système de formation continue à l'Université: l'analyse modulaire." OECD-CERI project, Grenoble, April 1973.

(free or not) to the outside, they constitute a final output. Similarly, the student taking a cycle of courses within the university is an intermediate output; the student who leaves the university (after passing or failing) is a final output. The convention must also be accepted that every graduate, at whatever level, "leaves" the university, even if he comes back immediately to take another degree course.

These outputs are "manufactured" in the different centres of production which, at the most basic level, are called Elementary Units of Activity (UEA).

(a) The intermediate outputs of the university include:

- the outputs of service UEAs (UEAPSs): computing centre, document-copying shop, library etc.;
- the outputs of administrative UEAs (UEAAs): central services of the university, administration of a UER or department, etc.

Other intermediate outputs are students taking a cycle of courses within the university and student aid services (scholarships, university canteen, hostels, etc.).

(b) Final outputs comprise:

- the principal final outputs:
  - . of education: number of graduates at the different levels, number of students dropping out of university, etc.;
  - . of research: discoveries, publications, patents, etc.
- ancillary final outputs, including:
  - . services to the public or the nation: libraries open to non-students, consultations at the university's medical centre, dissemination of knowledge to non-students (radio broadcasts);
  - . outputs or services not entirely consumed and sold outside, computer hours, hiring out of stadium, swimming pool, etc.

(c) The outputs of education should also be differentiated according to whether the student is considered in the course of the university year (in which case we shall refer to outputs awaiting allocation), or whether he is considered at the end of the year after the decision concerning his year (in which case he can be classed as a final or an intermediate output). The chart below shows the final position.

Outputs of education

Prior to decision

Outputs awaiting allocation
e.g.
Studies with a year structure:
- students in a year
- students in a cycle
- students in a UER

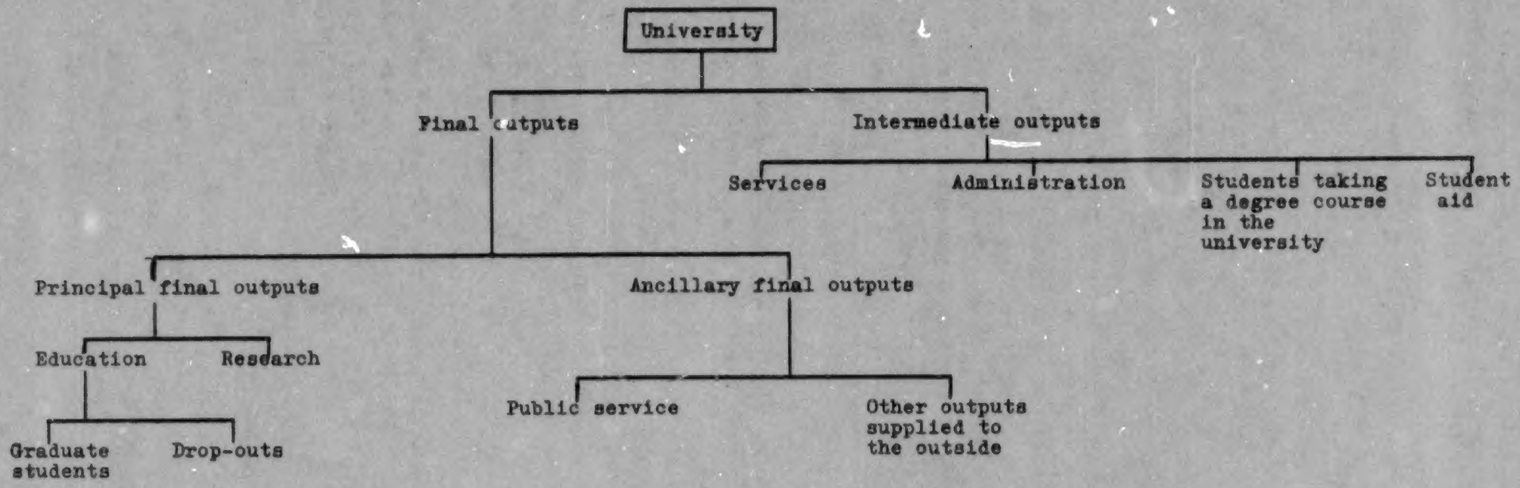
Studies with a credit structure:
- students in a credit
- students on a course leading to a university diploma in literary or scientific studies, a first degree, a master's degree.

After decision

Final outputs
- Graduates
- Students leaving the university
  - Transfer to another university
  - Dropouts

Intermediate outputs
- Repeaters
- Students working through a cycle

The various outputs, classified according to whether they are final or intermediate, are identified in the chart below


University
Final outputs
Intermediate outputs
Services
Administration
Students taking a degree course in the university
Student aid
Principal final outputs
Ancillary final outputs
Education
Research
Public service
Other outputs supplied to the outside
Graduate students
Drop-outs

1.3.2 Aggregate research costs and unit education costs

The Group decided to concentrate its efforts on calculating the costs of the principal final outputs. But education and research raise very different problems.

1.3.2.1 Aggregate research costs

In the case of research, the Group soon realised that until detailed publications were available about the work now being done by the Délégation Générale à la Recherche Scientifique et Technique and the Centre National de la Recherche Scientifique concerning the measurement of research outputs, it would be virtually impossible to make the transition from aggregate costs to significant unit costs. Thus, although the members of the Group will have to take research costs into account, they will probably be obliged to make do with calculating research costs as a proportion of the university's total costs (see, in particular, the survey on time budgets of teachers in Chapter 5 and the absorption of the cost of premises in Chapter 6).

1.3.2.2 Unit education costs

Where education costs are concerned, a distinction has to be made between activity costs and output costs. The elementary units of educational activity (unités élémentaires d'activité d'enseignement - UEAE) provide courses or credits. Certain unit costs will therefore be calculated at the level of UEAEs (see Chapter 7), e.g. unit cost per student per UEAE. Unit costs in respect of final outputs or outputs awaiting allocation will be computed on the basis of unit activity costs. However, at this last stage, the problem will differ according to whether or not the university has information about student flows and costs over the past few years. It will also greatly depend on whether a UER provides all the courses for a given degree (e.g. a UER for legal science covering all the courses for the four-year law degree) or whether it gives only a minority of the courses required for the degree (e.g. a UER for geography providing fewer than half the credits needed for the degree in geography). A clear distinction has also to be made between degrees with a year structure (e.g. a four-year law degree) and degrees with a credit structure (e.g. 24 credits needed to obtain a degree, although no credit can be pinned down to a particular year). For degrees with a year structure it is possible, for instance, to consider calculating an average student cost for a given year or a given cycle (for the four-year degree: 1st and 2nd years = 1st cycle; 3rd and 4th years = 2nd cycle). For the other degrees, an average cost will be calculated per student doing a degree course. Similarly, slightly different procedures may be envisaged for calculating the cost of graduates in the two cases (see Chapters 8, 9 and 10).

It should be pointed out that this separate treatment of education costs and research costs presupposes, or at any rate implies, that education and research do not constitute joint outputs in the strict sense and that they can therefore vary, within certain limits, independently of one another. This hypothesis is also found in Layard and Verry's publication (op. cit. p. 2).

1.3.3 Reference to the university year 1971-1972

For universities which do not have data files extending back a number of years, the Group decided to concentrate on collecting information for the university year 1971-1972. This information essentially comprises two sets of data:

- data on student flows for the different courses, credits and degrees;

- data on "commitments" for expenditure of all kinds connected with the running of the university.

Since the budget year does not correspond to the university year, the problem is to choose an annual framework of reference. A priori, two solutions were possible: to choose the budget year and "adjust" the numbers of students, taking into account enrolments over two university years; or else to take the university year and recalculate the "commitments" for that period (e.g. 1st October, 1971 to 30th September, 1972).

It is the second of these solutions which is proposed here:

- teaching appointments are made in most cases in October of each year;
- the "adjustment" of enrolments, courses and credits to the framework of the calendar year raises quite complex problems, especially when costs have to be calculated at a fairly basic level (unit cost of activities at the level of credits, student cost in a given year of a degree course, etc.) and when enrolments fluctuate sharply from one year to the next.

For certain items such as staff salaries, it will be relatively easy to calculate commitments over the 12 months from 1/10/t-1 to 30/9/t (cf. Chapter 3). On the other hand, for the breakdown of commitments financed from the university budget, it is proposed to attach one-third of the budget for the year t-1 and two-thirds of the budget for the year t to the fictitious budget for the university year (t-1, t). It is preferable to take three terms rather than four, since clearly the university is only really productive over three terms.

Reference has been made above to an accounting system showing expenditure "commitments" since a system based on "payments", which is the method used for the financial accounts of universities deviates too much from the real "consumption" of resources by these establishments. However, in some cases a commitment may not be followed up: as a result, the commitment figures themselves will have to be reviewed. In reality, what corresponds most closely to the beginning of "consumption" is the date of delivery of equipment and supplies.

1.3.4 Standpoint chosen for cost calculations

From the strict standpoint of calculating "costs" at the level of the university, it would be conceivable to consider solely the expenditures financed through the university budget (including the various budgets attached to it: university library, sports centre, etc.). It is certain that a calculation of this kind would be pointless. From a broad standpoint, which is greatly preferable, it is possible to think of focussing an economic cost comprising all the implicit costs and opportunity costs envisaged from the standpoint of the university, the Ministry of Education, the government or even the nation.

But the precise definition of the economic cost finally adopted depends on the decision-making level chosen. In this study, the basis chosen is the university and/or the Ministry of Education. It will in fact be seen later that for certain cost components (notably staff costs) these two "levels" merge.

This basis having been chosen, the proposed procedure is to try to ascertain:

(1) in the first place, the cost of all the inputs made available to the university (staff, operating facilities, materials, equipment, buildings and land);

(2) secondarily, the various forms of assistance given by the Ministry to students (scholarships, restaurants, university hostels)

The report will mainly concentrate on ascertaining the costs mentioned in (1) above.

On the other hand, the present study deliberately disregards certain components which can perhaps be reincorporated into a subsequent phase of research, namely:

- costs to the student, his family or the nation resulting from the fact that he postpones the date of his entry into working life;
- certain implied costs to the community resulting from the existence of the university (costs of central and regional administration, maintenance of roads on university land by the local authorities, protection against fire, police protection).

With the aim of identifying the suggested line of approach more precisely, four comments may be made.

1.3.4.1 It might seem that the only costs the proposed method ultimately takes into account are those financed by the national education budget and recorded in the national accounts, without any allowance for the basic economic concept of opportunity costs. But this is not so. In the case of land and buildings in particular, the proposal approach is typical of the concept of the opportunity costs. This represents the "profit" that is forgone through using a certain resource for one purpose rather than another. It is therefore quite conceivable that this cost should vary according to who makes the decisions: for instance, in the case of a university free to lease its premises to outsiders, the opportunity costs may be all or part of the potential rent at market prices. If the possibility of a rental does not exist, the opportunity costs to the university can be considered nil. At Ministry of Education level, the opportunity cost is equal to the "benefit" that would have been derived from assigning the buildings to another purpose in the public education sector. In handling building costs (Chapter 3), it is suggested that these different viewpoints be taken into account.

Depreciation, which it is also planned to take into account when calculating real estate costs, is another example of the economic cost which as yet is never reflected explicitly in the national accounts.

1.3.4.2 The choice of the decision-making body at the level of the university and/or the Ministry of Education also affects the calculation of the social security charges related to wages and salaries. These costs may be regarded from two standpoints, i.e. as benefits received or contributions paid. The first, it would seem, is more appropriate to the calculation of costs at government or state level. It is therefore the second that was chosen: social security costs will be calculated by reference to the contributions paid by the employer.

1.3.4.3 Although it is planned to allow for such costs as aid to students, these costs will be accounted for at the end of the process and there is no a priori reason why they should vary between students of different disciplines in the same university (see, however, the allowances drawn by third-cycle science students?). But perhaps they are liable to vary from one university to another (university hostels?).

1.3.4.4 The essence of the procedure proposed here derives, however, from cost accounting and centres on absorption costing, or assigning the cost of indirectly productive activities to directly productive activities. The latter ultimately lead to the different types of final outputs. Absorption costing is therefore a matter of identifying the relationships between the various components of the production system and taking account of these relationships. Not all production costs in regard to higher education are involved in this central procedure, so that certain cost components will still have to be reintegrated subsequently.

PART I

PRODUCTION INPUTS AND COST COMPONENTS IN FRENCH UNIVERSITIES

CHAPTER 2

RESOURCES AT THE DISPOSAL OF THE UNIVERSITY

To carry out its functions, the University has three types of resources: staff, fixed assets and operating funds, to which the sums intended for aid to students should be added.

Independently of the way in which these resources are financed, it is necessary to know how they are used in the many activities of the university.

The previous chapter showed that it was possible to distinguish between a number of different production centres:

- centres producing a final output: these are to be found within the U.E.R.s;
- centres producing an intermediate output: these break down into two distinct groups:
  - . service units whose output is directly or indirectly measurable;
  - . administrative units whose output is not measurable in physical terms.

Before analysing university cost components (Chapter 3), it is important to:

(i) identify the production centres;

(ii) catalogue and classify the resources at the disposal of these centres.

These are the two aspects which are dealt with in this chapter.

2.1 Identification of production centres

There is no typical university structure: the number and nature of the production centres vary, although they appear in one form or another in the specific organisation of each university.

Although it is not possible to draw up an exhaustive list of these centres in the present study, the annex provides a list of the main services to be found in universities (Annex 2-1).

The organisation chart shows:

1. U.E.R.s whose chief outputs are education and research, with possibly some ancillary outputs.
2. Service units.
3. Administrative units.

These last two categories may be:

- attached to a unit of education or a unit of research; or
- common to the education and/or research units of a U.E.R. (e.g. a document-copying service); or

- common to a number of U.E.R.s (e.g. a library); or
- common to the university as a whole (general administrative services); or
- less frequently, common to a number of universities (e.g. inter-university library).

From the practical standpoint, it will probably be useful to classify these units.

Two points may be made here:

- first, the destination of outputs from the different services will not be considered here; this question will be dealt with in the chapter on the assignment of intermediate outputs (Chapter 6);
- secondly, production centres do not coincide exactly with cost centres: there may be nominal cost centres (e.g. a centre of "building costs", c.f. Chapter 6).

2.2 Resources at the disposal of production centres

All the centres of activity use staff, fixed capital and appropriations for current operations.

It is proposed in this chapter to describe and catalogue the components from which the costs associated with these centres will subsequently be calculated, assignment of costs being studied in a later chapter.

2.2.1 Operation

This term should be understood in its strict sense: it does not cover staffing costs which, with some exceptions, are met out of the national budget. Some universities devote a considerable share of their own budget to the remuneration of personnel, i.e. not only teachers but particularly administrative, technical, manual and service staff.

To meet its operating costs, the university has two types of resources:

A. Its own resources.

These consist essentially of fees paid by students (fees for tuition, practical work, medical care).

B. State subsidies.

These are of three kinds:

1. Subsidies from the Ministry of Education (teaching), awarded according to different criteria:

- A proportion of the subsidies is common to all disciplines (operating subsidies). For this proportion the criteria used in 1971-72 were as follows:
  - . a subsidy of Frs.30 per sq.m of premises;
  - . a subsidy of Frs.100 per student.

  For universities with a campus layout, an additional subsidy of Frs.0.30 per sq.m of area exceeding twice the built-on area was awarded.
- A proportion of the subsidies is adjustable according to discipline (practical work). The following coefficients used in 1971-72:

Law and economics:	coeff. 1	Frs.40 per student
Humanities:	coeff. 1.5	Frs.60 per student
Medicine and Pharmacy:	coeff. 5.5	Frs.220 per student
Science:	coeff. 15	Frs.600 per student

2. A subsidy from the Ministry of Education (research) awarded according to other criteria.

3. A subsidy from the Ministère de la Jeunesse et des Sports (Ministry for Youth and Sporting Activities).

These resources are apportioned among the units of the university by the Conseil de l'Université (University Council) (operation) and the Conseil Scientifique (University Science Council) (research).

The scale of the appropriations administered directly by the central services of the university varies according to the way in which the university is organised. For example, in the case of a university organised along campus lines, there are at least three major items in the budget:

- joint "expenses" (heating, water, fuel oil, etc., telephone, upkeep of grounds, etc.);
- functioning of the central administration;
- appropriations assigned to the U.E.R.s according to rules specific to each university.

It does not seem necessary here to go any further into this aspect, estimation of operating costs being dealt with in Chapter 3.

2.2.2 Staff

Whether the staff employed in the different centres of activity are paid out of the government or the university budget, it will be necessary to identify the number and kind of staff employed in each unit.

Examples: Document copying service common to U.E.R.s 7, 8 and 9.

- 3 technical secretaries: Miss X, Miss Y and Miss Z.
- 1 5B technician: Mr. Dupont.
- 1 3B technician: Mr. Durand.

Insofar as an exact breakdown of university staff assignments is required, names will appear for each service, the use of a code number making it possible to process the information more rapidly.

The assignment of staff to a given unit of activity is a sufficiently familiar procedure to make it familiar procedure to make it unnecessary to go further into this question.

Where teachers are concerned, however, the application of rules for the division of their time between teaching and research will make it possible to arrive at full-time equivalents (these rules may be based on an analysis of "time-budget" questionnaires).

2.2.3 Fixed assets

The most difficult questions arise in connection with fixed assets.

There are several types of fixed assets:

- . land
- . premises
- . furniture
- . office equipment
- . scientific equipment

It is not intended at this point to discuss the problems that arise in connection with estimating the value of these fixed assets; that question will be dealt with in Chapter 3. It is proposed here simply to check off these fixed assets.

Few French universities have a complete inventory of the equipment they possess. The main reasons for this are well known:

- recentness of most universities, so that there has not been time to draw up this inventory;
- diversity of the funds for certain fixed assets (equipment supplied by the Centre National de la Recherce Scientifique, purchases under research contracts, etc.).

In many cases, however, universities have systematically catalogued equipment purchased recently (equipment purchased with funds allocated to them). But an exhaustive listing and, above all, estimation of the value of the stock of materials and equipment require time and resources far in excess of what is provided for in the contracts signed with the O.E.C.D. This work is, incidentally, more appropriate to the competent services of the university than to a research team.

Bearing in mind that the French group will give pride of place to education in the computing of unit costs, it is still possible to know fairly accurately the number and the characteristics of the fixed assets required in order to arrive at this final output: even accounting for all the fixed assets of branches working for both education and research, it is possible to draw up descriptions for each unit. Although it seems unrealistic to expect exhaustive accounting on the part of universities with a large proportion of science units, it should be much easier to catalogue materials and equipment in universities with units doing research on human sciences, as this research requires less equipment.

From a practical standpoint, it seems easier to catalogue fixed assets by premises, which is a way of avoiding oversights.

Very broadly, the procedure could be as follows:

- for each building in the university, a listing of premises with a record of their main features;
- for each set of premises, a record of the staff and equipment working therein or assigned thereto.

Some very simple draft descriptions are given in Annexes 2 and 3.

ANNEX 2.1

EXAMPLES OF A UNIVERSITY'S MAIN CENTRES OF ACTIVITY

I. President's and Vice-President's offices

II. General Secretariat

III. General administration

III-1 General affairs

- Science Council
- University Council
- Elections
- Creation of courses
- National degrees and diplomas
- etc.

III-2 Information - Public relations

- Relations with the press
- Student information
- University newsletter
- Documentation
- International relations
- etc.

III-3 Management of teaching staff

- Appointments
- Promotion
- etc.

III-4 Management of administrative, technical, manual and service staff

III-5 Student enrolments and records, etc.

- Students' files
- Enrolments
- Equivalent foreign qualifications
- Degrees and diplomas
- Statistics
- I.P.E.S. (Institutions training secondary school teachers)
- etc.

III-6 Government accounts

- Salaries
- Additional teaching service
- Miscellaneous increments and allowances
- etc.

IV. Financial services: university accounts

IV-1 General accounts

IV-2 Payments control and authorisation

IV-3 Payments branch

V. Other joint services

(These may be common to all U.E.R.s or only to some. No standard plan is given here, but simply a non-exhaustive list of the services that may be met with.)

- Medical service
- Computing centre
- Printing shop
- Typing pool
- University library
- Reception of foreign students
- Document-copying service
- Television courses
- Pedagogical documentation centre
- O.N.I.S.E.P. (information on careers and outlets)
- Technical service
- Student placement service
- etc.

VI. Units of education and research (U.E.R.)

(Some of the services listed below may be attached to one U.E.R. only or be common to a number of U.E.R.s).

- Director's office
- Director's secretariat
- Student enrolments
- Timetables
- Students' files
- Examinations
- Scholarships and grants
- Education: Degree and diploma courses
  Institutes and Centres providing courses
- Research: Research teams and groups
  (Institutes and Centres performing research)

VII. U.E.R.s with special status

These generally have an individual administration which is more developed than those of the U.E.R.s mentioned above. They also use their appropriations with a greater degree of autonomy.

VIII. Other services

VIII-1 University welfare services

- restaurants
- hostels
- outside lodgings
- general administration
- reception, information
- social service
- cultural service
- etc.

VIII-2 Rectorial and central administration

VIII-3 etc.

Note: The numbering used here is intended simply as a guide: each university may, of course, use its own coding system.

ANNEX 2.2

MAIN ITEMS IN A BUILDING DESCRIPTION

Name and location of building:

General features

Legal specifications: owned
rented

Date of construction: beginning of work
completion of work

Date of entry into service

Built-on area

Aggregate floor space: without basements
with basements

Usable floor space

Total built-on area

Financial particulars

Total cost of construction
(with date and amount of payment allocations granted)

Allocations for initial equipment

ANNEX 2.3

EXAMPLE OF A DESCRIPTION OF PREMISES

Building in which premises are located	e.g. Science Faculty, 2 Boulevard Gabriel			
Type of premises	Amphitheatre			
Name	Pasteur			
Floor space (sq. m)	620			
Number of seats (in the case of teaching premises)	482			
Furniture assigned to the premises (not including allocations for initial equipment)	Nature	Make and type	Date of purchase	Purchase price
	-	-	-	-
Equipment assigned to the premises	Nature	Make and type	Date of purchase	Purchase price(Frs.)
	Projector	Leitz M 12	1970	645
Normal use of premises during the academic year	Exclusive use by one U.E.R. or department (name)	Use by more than one U.E.R. or department (names)	Total hours of use per week	
		Physics U.E.R.	20 hrs.	
		Chemistry U.E.R.	18 hrs.	
		Economics U.E.R.	4 hrs.	
Exceptional uses (hours per year)	Conferences	33 hrs		
	Conventions	-		
	Entertainment	4 hrs		
	Vacation courses	-		
	Other	-		

CHAPTER 3

DIFFERENT TYPES OF COSTS

Four main types of costs are discussed in this chapter:

- staff costs
- capital costs
- operating costs
- transfer costs.

As has been seen in Chapter 1, their importance will vary according to the standpoint adopted. This will therefore be specified wherever necessary.

3.1 Staff costs

The first problem is the cost concept to be adopted to evaluate this type of cost. Although use of the opportunity cost concept is desirable in any study designed to improve decision-making, it seems difficult to go very far in estimating this cost to the body which pays the staff concerned. The cost used will be essentially an accounting cost: the different components of the latter which figure, collectively or individually, in the financial documents will have to be estimated.

Although, in the case of the university, the costs relating to the staff which it pays from its budget can easily be estimated from that budget, the real cost of the staff paid directly out of the Ministry of Education budget is much more difficult to determine.

Moreover, to have a complete picture of the costs connected with staff employed, it is necessary to go to government level: knowledge of these costs at Ministry of Education level only is not enough, since the cost components are not all handled by this decision-making centre.

Before these components are analysed, the degree of accuracy which is expected in the evaluation must be clearly stated. This problem in fact is partly concerned with the significance of cost differences.

Simplifying somewhat, there are six different approaches which may be listed in pairs:

- services actually performed or average estimate of these services from contributions;
- individual or average approach in respect of a homogeneous group of staff;
- observations over the whole period under consideration or sample survey.

Between the systematic application of the first alternatives of the last two pairs (individual approach, observations throughout the period under review) whose results are more detailed but often take longer to obtain, and the application of the second alternatives whose results are more general but available sooner there are four possible choices based on a combination of these approaches.

Without going into the details of the calculations, the main problems of each approach are briefly as follows:

(a) When estimating the cost of an employee, numerous charges must be added to the main component of remuneration. These must be evaluated on the basis of the benefits actually paid out if the intention is to evaluate the cost to the nation, since an evaluation of contributions would reflect the standpoint of the employer, i.e. in the present case, the Ministry of Education. In view of the comments made by the majority of the group of French universities taking part in the project, the cost of staff will be estimated from the second standpoint: the charges will therefore be expressed in the form of contributions.

(b) Should the method of estimation described above be applied to each staff member, or should a less detailed estimate based on average costs be adopted by grouping together staff with common characteristics, for example?

A classification for this purpose may be suggested here:

- staff may be grouped into three "categories":
  - teachers
  - research workers
  - administrative, technical, manual and service personnel;
- a more detailed analysis would be based on "grades" (e.g. professor, assistant, technician 1B, university administration secretary, etc.);
- however, if this degree of detail is not required, staff may be classified in "groups" that are fairly homogeneous from the standpoint of status.

For teaching staff we propose the following groups:

1. Professeurs (professors), maîtres de conférences (senior lecturers), chargés d'enseignement (lecturers).
2. Chargés de cours (lecturers in law and economics).
3. Maîtres-assistants (established assistant lecturers).
4. Assistants (assistant lecturers).

Technical assistants who do teaching work in their department (a fairly rare occurrence) will be equated with the grade corresponding to their qualifications.

Research personnel will be classified as a single category, as one aggregate research cost will be calculated for the purposes of this study.

The last category of personnel - administrative, technical, manual and service personnel - may be broken down into groups in different ways. The first method is to retain the administrative classification and to identify three groups:

1. Administrative personnel.
2. Technical personnel.
3. Manual and service personnel.

This method has two disadvantages, however, where the first two groups are concerned. In the first place, the services actually required of certain administrative and technical staff are often very similar if not identical; secondly, these two groups are themselves very diverse. A second method would be to use a four-group breakdown based on the civil service classification (A, B, C, D), the above three groups being reclassified in this new range according to their pay index (the equivalence between the two classifications is shown in Annex 3-1). To make comparisons easier, it is suggested that this last breakdown be used. Some universities may prefer a detailed cost calculation by individualising staff costs. They will, however, have to ensure that staff can be reclassified into groups for purposes of comparison. The results of the exercise will show numerous differences in cost; the main areas of difference include:

- the actual composition of each category or each group;
- length of service of personnel in each grade;
- disparities connected with wage zones.

(c) As regards the third approach, the books may be examined once or more during the year. The most accurate procedure would be to keep close track of all changes affecting personnel (salary increases connected with promotion, rise in the value of the salary index point, etc.). The most rapid procedure, on the other hand, would be to take a reading of the situation of the university's personnel in the month considered to be the most representative, but to include items of remuneration paid on a non-monthly basis. Obviously, the fewer the months investigated, the less accurate this method of ascertaining costs will be (omission of salary adjustments by staff category, back-pay, etc.). Between these two extreme solutions, a number of intermediate options are open.

Depending on the way its books are made up, each university can use the method it considers appropriate. To sum up, it is recalled that in order to be able to make significant comparisons, the majority of the group of French universities were in favour of presenting at the very least an estimate of teaching staff costs in the form of an average per "group" of staff at U.E.R. level. On the other hand, in the case of administrative, technical, manual and service personnel, the estimate of the average cost will have to be established at university level. Furthermore, in these calculations, systematic reference will have to be made to the employer's contributions in order to evaluate the amount of social and tax charges attaching to the remuneration of personnel.

The amount of appropriations used for the remuneration of personnel and the complexity of the corresponding cost make it necessary to examine the components of this cost in detail.

Two types of remuneration are paid to the various categories of personnel:

- "indexed pay" (i.e., based on the public service salary index);
- various increments and allowances.

Since it is the real cost of personnel to the employer which is under consideration here, employer's costs will have to be added to the above remuneration components.

3.1.1 Indexed pay

Apart from personnel who receive an allowance (e.g. student monitors), the salaries of nearly all staff are linked to an index. The two main components of remuneration, paid to all staff, are the gross indexed salary and the accommodation allowance, which varies according to the location of the place of work. Evaluation of these components entails no difficulties as the former is linked to an index the value of which at any given time is known, while the latter is a function of the former.

In addition to these main components there are a great many pay elements which are awarded according to a wide variety of criteria.

3.1.2 Increments and allowances

A distinction must first be made between personnel of universities in the Paris area and personnel of universities in the provinces, in that the former receive a specific allowance (transport allowance).

A further distinction is necessary between the different categories of personnel.

3.1.2.1 Teaching staff

Teaching staff may receive three broad types of allowance and/or remuneration:

- a flat-rate teaching allowance;
- an annual research increment (for certain grades of teachers) paid in two half-yearly instalments;
- remuneration for additional teaching.

Teaching personnel may also receive other remuneration linked with their university activities (allowance for direction of research, allowance for administrative duties, etc.).

A number of comments are in order here.

The flat-rate teaching allowance is paid automatically.

The research increment cannot be paid to teachers whose remuneration exceeds a given ceiling. However, since such cases are fairly rare, the cost of the research increment will be added in for all teachers eligible to receive it.

Additional teaching, although not systematically done by all teaching staff, is a sufficiently widespread practice to warrant inclusion of its cost in the remuneration total, which will make it easy to calculate an average cost per teaching hour per group of teaching staff.

To calculate this cost, it will suffice to reckon up the number of hours (usually expressed as a yearly total) worked by each teacher, the hourly rate of remuneration being known.

3.1.2.2 Non-teaching staff

Leaving aside exceptional allowances (e.g. for loss of employment), the total remuneration of non-teaching staff includes a number of increments and allowances awarded according to different criteria. Although these are generally awarded fairly consistently, they should not be regarded as automatic, since in some cases they are determined by the number of hours of actual attendance, while in others they are awarded after a favourable report on the employee concerned, and so forth.

A list of the main increments and allowances received by non-teaching personnel is given in Annex 3.2.

In the case of most increments, the amount awarded varies according to the grade of the employee. However, in order to speed up the calculation process, it would seem preferable to use this detailed analysis and reclassify the grades into groups, which can be done without difficulty.

It is therefore proposed to calculate the average annual rate of the increment(s) and allowance(s) awarded to each employee, taking his or her grade into account. This rate is usually obtainable except in the case of the bonus for overtime work awarded to established administrative and service personnel, the amount of which varies according to the grade of the employee and his or her position on the salary index scale. In this or similar cases, a study of the situation in the university concerned will enable a more realistic estimate to be made.

On the other hand, if the object is to determine the exact amounts received, there will have to be an exhaustive survey of all the salary components paid over a full year or in certain judiciously selected months in the case of sums which are not paid monthly.

If there are any additional increments and allowances of an entirely exceptional nature, these can either be calculated exactly or estimated at a flat rate to be added to the average cost per grade or per group as calculated up to this point.

3.1.3 Social security and fiscal charges

To the various components of staff remuneration should be added the social security and fiscal charges payable by the state as employer.

Before these charges are analysed, the status of the various employees must be taken into account, since rates will vary accordingly.

In theory, there are eight different situations as shown in the two tables below.

Teaching staff:

	Established	Non-established
Remunerated from national budget	Professor	Example: chargé de cours
Remunerated from university budget	(1)	Example: maître de conférence - associé

(1) Since this case never arises, there are in fact only seven situations.

Non-teaching staff:

	Established	Non-established
Remunerated from national budget	Example: University administration secretary	Example: Auxiliary clerk
Remunerated from university budget	Agent Comptable	Example: Auxiliary service employee

Contribution rates will vary from case to case. They will be applied to the "basic salary" of the employee, the salary components varying according to his or her status.

. For established staff, the basic salary is equal to the gross indexed salary before any deduction at source for pensions (principle of the same base for employees' and employers' contributions).

. For non-established personnel, the basic salary comprises all items of remuneration received, namely:

- gross indexed salary before deductions for pensions;
- accommodation allowance;
- various other allowances and increments (transport allowance, research increment, flat-rate teaching allowance, research participation increment, allowance for administrative duties, allowances for additional teaching activities, allowances for special duties, etc.);
- supplementary family allowance(1)

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(1) Strictly speaking, this last item is not part of the basis for calculating contributions due by the state under the supplementary pension scheme for non-established staff. In fact, this may be omitted from our calculations: an overall contribution rate will be applied to all the remuneration components of non-established staff.

Before specifying which contribution rates are to be used, it is necessary to consider the different charges.

3.1.3.1 Fiscal charges

There are three such charges:

(i) The contribution to the housing fund.

(ii) The transport tax: in 1971-72 this was due only from employers in the Paris area.

(iii) The flat-rate payment on salaries.

3.1.3.2 Social Security charges etc.

A. Method of evaluation

As the table below shows, there are several different ways of evaluating these charges.

Social Security charges etc: method of evaluation used

Social charges \ Status of personnel		Established staff	Non-established staff	
			Remunerated from national Budget	Remunerated from university Budget
Social insurance	Sickness Maternity Disablement	Contribution	Contribution	Contribution
	Old age	-	Contribution	Contribution
	Supplementary retirement pension	-	Contribution(1)	Contribution(1)
Industrial accidents		(2)	(2)	Contribution
Family allowances		Contribution	Contribution	Contribution
Supplementary family allowance		Benefit payment(3)	Benefit payment(3)	Benefit payment(3)
Retirement pensions		(4)	-	-

(1) We disregard the fact that the supplementary family allowance is not one of the remuneration components on which this charge is based.

(2) See paragraph (b) below.

(3) The relevant appropriations are levied direct from the Ministry of Education budget. This benefit is not compulsory for universities which pay staff from their own budget.

(4) The relevant appropriations are entered under the joint costs of the national budget.

B. Contribution rates

The diversity of French social insurance schemes and the complexity of the methods of calculating contributions make a detailed analysis necessary, especially as in some cases the state as employer does not actually pay contributions but simply makes the cash adjustment required to balance the accounts.

Although the application of official scales is perfectly conceivable in all cases, it is nevertheless necessary to weigh the expediency of using two types of charges that raise questions of principle.

(a) Industrial accidents sustained by personnel remunerated from the national budget

The state, being its own insurer, pays no contributions in respect of industrial accidents but pays out the benefits direct. It is therefore impossible to use the contributions standpoint. In the case of temporary disablement, the employee concerned receives his remuneration in full and may be replaced by a temporary employee; this second remuneration will be assumed to be the benefit. In the case of permanent disablement (early retirement), it is unfortunately impossible to determine the cost.

(b) Retirement pensions of established staff

The state pays no contribution to the pension scheme for civil servants but provides extra funds in cases where the pension fund constituted by contributions from salaries is insufficient for the purpose. Since no data is available concerning the management of the pension fund, it has been necessary to make a calculation based on an average career profile and to define the discount rate (approximately 6 to 7 per cent according to category), which shows a nil cost to the state.

Consequently, in these two cases no employer's contribution can be allowed for.

Readers requiring more specific information on the processing of this data are asked to consult the French edition of the report published by the Group.

By way of example, the tables below show the main contribution rates for 1971-72 (expressed as a percentage of basic salary).

per cent

Nature of charges expressed as contributions	Established staff		Non-established staff	
	Portion below the Social Security ceiling	Portion above the Social Security ceiling	Portion below the Social Security ceiling	Portion above the Social Security ceiling
Sickness, maternity, disablement	9	2	12.45	2
Old age	-	-	5.75	-
Supplementary retirement pension	-	-	1.41	5.10
Industrial accidents	-	-	- 2.60 (1) (2)	-
Family allowances	9.60	-	9.60 10.50 (1) (2)	-
Housing fund	0.10	0.10	0.10	0.10
Transport levy (Paris area)	1.70	-	1.70	-

(1) For employees paid from the national budget and remunerated according to the official index.

(2) For employees paid from the university budget or employed on a temporary basis and paid from the national budget.

			percentage of remuneration
Flat-rate payment from salary	Employees paid from university budget	Portion of remuneration under Frs.30,000 per year	4.25
		Portion between Frs.30,000 and Frs.60,000	8.50
		Portion over Frs.60,000	13.60
	Employees paid from national budget	Total remuneration	4.25

3.1.4 Practical methods of calculating the wage cost

The fact that there are so many different cases involved provides an argument in favour of an automatic formula based on the construction of a series of functions of the type

$$C = f(R, T)$$

where C is the total cost of an employee,

R is the annual gross remuneration, and

T is the gross indexed salary.

3.1.4.1 Calculation of the gross annual indexed salary (T)

There are two possible methods.

(i) The weighted average value of the index point is applied to the remuneration index of the employee concerned. This solution, the principle of which is very simple, calls for equalisation in cases where there is a change of index point (change of grade, advancement within the grade or reorganisation of careers) in the course of the academic year.

This method therefore offers little advantage when it comes to precise individual calculations but is very convenient when the calculations are based on groups of employees with common characteristics since it is sufficient to estimate the average index for the group.

(ii) The university accounts are consulted, the real gross indexed salary for each employee being entered each month in the remuneration ledger which each university is required to keep. This method has to be used in the case of individual calculations.

3.1.4.2 Calculation of gross annual remuneration (R)

The various increments and allowances added to the gross salary according to grid in order to form the gross remuneration have been listed in paragraph 3.1.2. The only method that can be used here is to collate from the accounts, while watching for timelags (back-payments, allowances paid late, etc.) between the date of the work or function giving rise to an allowance and the date of the relevant payment.

3.1.4.3 Calculation of the wage cost (C)

This calculation is the direct result of applying the appropriate C = f(R, T) equations.

The parameters in these equations are the status of the employee, the level of R in relation to the Social Security ceiling, and the level of T in relation to the levels of change in the flat-rate payment on salary. Each university has to construct fifteen equations in all.

Example: Let there be an established staff member for whom

$$\left.\begin{array}{l} R = \text{Frs.}54{,}905 \\ T = \text{Frs.}39{,}978 \end{array}\right\} \text{from 1st October, 1971 to 30th September, 1972}$$

The appropriate equation $C = 1.0425\ R + 0.02\ T + 3556$ gives C = Frs.61,594, i.e. an employer's cost of Frs.6,689.

3.2 Capital costs

All items of property which have a life of more than one year and are listed in an inventory are regarded as tangible capital assets.

The standard accounting system of French public institutions of an administrative character distinguishes between several categories of tangible capital assets:

- land
- buildings
- collections
- transport equipment
- equipment and machinery
- other tangible capital assets
  - furniture, office equipment
  - fixtures, fittings, etc.
  - other capital assets.

In addition there are "establishment costs" (e.g. conveyancing and registration of property).

Three types of problems have to be considered in evaluating the cost of tied-up capital:

- the life-span of these assets;
- the value of the capital tied up;
- the methods of determining the cost of this capital.

3.2.1 Life-span of capital assets

Although land and collections have what may be regarded as an unlimited life, the choice of a realistic life-span arises for both movable and immovable assets. Given that there are no universally accepted norms in this regard, three possibilities exist.

A. The life-span figures recommended by the authorities can be used. For immovables they are as follows:

Nature of immovables	Life-span	
	Minimum	Maximum
- Buildings constructed with good-quality materials	50 years	125 years
- Light constructions	20 years	50 years

In the case of movable assets, a ministerial circular dated 12th December, 1966 lays down depreciation periods for the main types of equipment used by the French education system.

One criticism that may be levelled at this circular is that the life-spans it prescribes for certain types of assets are too long.

B. Use can be made of the life-spans approved by the Code Général des Impôts for private enterprises.

The usual periods prescribed are as follows (by major category):

Dwellings	25 to 100 years
Business or administrative buildings	25 to 50 years
Industrial premises	20 years
Plant and equipment	10 years
Private motor cars	5 years
Trucks and lorries	4 years
Automatic data processing equipment	40 months

C. The third option is to call in experts.

The advantage of this method is that it takes more account of individual cases. It is therefore more flexible and more realistic.

. Where buildings are concerned, the quality of the materials used varies considerably from one university to another.

. Where equipment is concerned, the real rates of use are also very variable. An agreement between users and the technical services should make it possible to determine a realistic life-span for each type of capital asset. Another solution would be to adopt the life-spans used by the CNRS for calculating the depreciation of its equipment(1)

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(1) The life-spans are as follows:

- technical equipment (e.g. recording equipment)	10 years
- apparatus	10 years
- office furniture	10 years
- office machines	5 years
- vehicles	5 years
- scientific equipment	4 years

3.2.2 Value of capital assets

There are two possible approaches.

(a) An evaluation can be made on the basis of purchase value. Land is also entered at its purchase cost, changes in its value being considered only in the event of its transfer and therefore in the form of a capital appreciation or depreciation.

(b) If the real value of capital assets is to be taken into account, their replacement value must be ascertained.

Land is therefore entered at its present value: this will be estimated at the market price prevailing in the locality. [The French Department of public lands ("Domaines") or the departmental directorates of the Ministère de l'Equipement can be consulted for this purpose.]

In the case of buildings, a distinction has to be made between those for which the services concerned can supply figures for construction costs and those for which no such information is available (e.g. the Sorbonne). The present value of buildings in the first category will be expressed by applying an appropriate index to their purchase value(1). Buildings in the second category can be revalued by estimating the present cost of premises with the same usable floor space and in the same locality.

The current value of equipment will be determined either by applying an index appropriate to the nature of the equipment, or by reference to the prices at which similar equipment can currently be obtained (cf. catalogue of the Union des Groupements d'Achats Publics, for example). For specific items of equipment (not purchased on the official procurement market or on the wholesale market), reference will be made to the life-spans estimated by users.

For transport equipment the market prices for second-hand vehicles will be consulted.

Clearly the main area of difficulty will be the inventory of the different items of equipment and their assignment to different uses, since in the new universities such inventories, where they exist, are of very recent date.

3.2.3 Calculating the cost of capital assets

This cost varies considerably depending on what level of decision-making is taken as a standpoint. At the level of current management, the book cost concept will be used. At a higher level of decision-making, on the other hand, the cost is defined in terms of the alternative uses which are sacrificed, which means that the concept of the economic cost, i.e. the alternative cost, has to be introduced.

A. The cost of current management

For accounting purposes this cost is ascertained from the depreciation, which means discarding the narrow standpoint according to which the capital subsidies granted each year cover the cost of renewing capital assets. It is therefore necessary to introduce appropriations for depreciation.

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(1) For example, the weighted Departmental index ("Index pondéré départemental") which is the coefficient of readjustment of building prices for a given "Département". It reflects the trend in the prices of building materials and labour.

The proposed method of depreciation is linear; the reference value is the replacement value of the capital asset, the life-span of which is known.

For purposes of simplification, it is possible to write off the assets acquired in the course of the year as from the year following the purchase.

Thus, an asset of purchase value A with a life-span of n years will, during year i, necessitate an appropriation for depreciation equal to:

$$a_i = \frac{A.r_i}{n}$$

r_i being the coefficient of re-evaluation for year i in relation to the year of purchase of asset A.

B. The cost from a decision standpoint

This cost will depend on the level of decision-making taken as a standpoint:

- For the nation: all alternative uses are possible (including the transfer of public buildings to the private sector).
- For the government: it is realistic to consider that only alternative "public" uses will be possible.
- For the Ministry of Education: alternatives exist either in the framework of the public education system or in that of higher education, if a narrower standpoint is adopted.
- For the university: given the present conception of the university, the cost will be calculated from the management standpoint only. It is evident that in a different framework the university can have alternative uses for its assets (if, for example, it has the full disposal of its present assets). For the time being, these alternatives apply only to its owned assets, when it has any.

As stated in Chapter I, several approaches can be adopted in order to assess this alternative cost in money terms. For the purposes of the present study, the economic cost will be taken in its strict sense: a rate of discount will be applied to update the value of the capital assets.

It is therefore possible to evaluate the cost of the capital assets by applying the formula of the constant annual allowance for depreciation, which combines the actual depreciation and the financial charge connected with the asset.
If A is the purchase value of the asset,

n its life-span ($i \in \{0,1,\ldots,n\}$)

r_i the coefficient of revaluation for year i in relation to the year the asset was purchased

and t the rate of discount chosen by the decision-maker, the cost of the capital asset in year i will be

$$a_i = \frac{A.t.(1+t)^n.\ r_i}{(1+t)^n - 1}$$

or again $a_i = a.r_i = A.r_i \dfrac{t}{1-(1+t)^{-n}}$

a being the annual depreciation allowance calculated on the basis of the non-revalued purchase price of the asset.

For land, the financial charge is equivalent simply to the product of the present value and an interest rate which we propose should be the same as discount rate, for present purposes. Within the framework of the present study, this rate may be 10 per cent a year. It is the same as one of the rates used in the preparation of France's Sixth Plan.

3.3 Operating costs

These costs figure in the budgets of the institutions we are studying (university, student welfare, etc.), with the exception of personnel, capital and transfer costs.

They are commitment accounting costs, with allowance for stock variations; only the costs committed during the period under review will be entered.

The costs may also be equated with the expenditures recorded in the commitment accounts.

3.3.1 Nature of operating costs

This is specified in the budget. Costs are classified by their nature in the following separate accounts:

- Purchases
- Taxes (i.e. the proportion not entered under staff costs)
- Work, supplies and outside services
- Transport and travel
- Use of allocated resources
- Miscellaneous management expenses
- Financial charges.

Where stocks are concerned, two sub-accounts, i.e. "decrease in stocks" and "increase in stocks" will be used in order to make the transition from the purchase standpoint to the consumption standpoint.

3.3.2 Calendar year/university year adjustment

Since unit costs are calculated within the framework of the university year, various techniques have to be used in order to express operating costs in this framework.

It is possible, for example, to assign a standard proportion of the operating costs recorded over a financial year to each of the university years that overlap it. The scales most often proposed are $\frac{3}{4}$ - $\frac{1}{4}$ and $\frac{2}{3}$ - $\frac{1}{3}$. This method has the advantage of being rapid, but in periods of significant cost fluctuation it may ultimately conceal certain trends.

It is also possible to make up the accounts at a fixed date (e.g. 1st September), committed costs being identifiable from the invoices unpaid as at that date. Two difficulties arise, however: for one thing, certain expenditures for a given academic year are pledged well before that year begins (e.g. expenditures connected with enrolments); for another, the evaluation of stock variations will necessitate an additional specific exercise.

We feel that this second method would be preferable to the first if it were not so cumbersome. It is therefore proposed to use the first method of evaluation, with $\frac{2}{3}$ - $\frac{1}{3}$ as the scale.

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If it is decided to work direct from invoices, the delivery date will be used, as it is the best indicator of effective utilisation.

3.3.3 Functional classification of operating costs

Although the accounting method provides for a functional classification of costs at the level of the joint services and the Units of Education and Research, the aim of the present study necessitates much more detail. This gives rise to three problems.

(a) The interrelationships between the different services of the university are not identified systematically: not all these services issue vouchers or invoices. Even a rough type of accounting system must be introduced.

(b) A distinction between education and research is not made systematically in the accounting records. The accounts covering research contracts and government-subsidised research record only a proportion of the operating costs that go through the university budget. For immediate purposes, interviews with directors of UERs and/or laboratories may provide the information necessary to make a first breakdown of the costs connected with these activities.

(c) Even if these first two difficulties are resolved, the problem of breaking down operating costs among the different elementary units of activity still remains, since it can only be solved by extremely detailed recording of costs.

It is clear that with the present procedures for recording operating costs, the only possible course is to use arbitrary apportionment criteria. On this point the reader is referred to Chapter 6.

3.4 Transfer costs

This heading covers costs which are not yet recorded and which represent assistance payments to the student and/or his family.

These costs can be classified in two categories.

3.4.1 Direct assistance

This assistance is mainly in the form of scholarships (education and research). The amounts of these scholarships vary in accordance with certain social criteria. Given the differences observed in the social origin of students according to the educational establishment attended, it is necessary to know the amount of the scholarships awarded according to discipline. In this way, the impact of this assistance on the student's academic career may perhaps be revealed.

The miscellaneous assistance given to students in exceptionally disadvantageous situations must also be entered; the corresponding appropriations figure in the accounts of the student welfare services.

Grants awarded to students of the "Instituts de Préparation à l'Enseignement du Second Degré" (institutes for training secondary school teachers) constitute a special case. The appropriations for these grants can be regarded for purposes of analysis as a sort of pre-salary payment connected with the students' trainee status. Although this assistance is very useful in that it enables certain students to continue their studies, it does not seem appropriate to treat this type of expenditure as a cost that should be brought into our analysis. By the same token, however, it is proposed to include the allowances received by third-cycle science students, these allowances being more in the nature of scholarships in that they cannot be regarded as an advance salary payment on a long-term contract.

Lastly, it would be desirable to enter under the heading of assistance the cost to the government of operations connected with student welfare services (operating and capital equipment subsidies, remuneration of certain staff from the national budget, financing of new buildings).

3.4.2 Indirect assistance

Three forms of assistance may be listed here.

(i) State contribution to the students' social security scheme.
(ii) Loss of revenue to the state due to the fact that students up to the age of 25 can be counted as dependants for income tax purposes.
(iii) Indirect cost to the state due to the fact that students up to the age of 20 are regarded as dependent children for the purpose of calculating family allowances.

In accordance with the approach chosen in Chapter I, this type of assistance will not be taken into account.

ANNEX 3 - 1

NOTE ON THE METHOD OF CLASSIFYING STAFF

The staff of a university comprises several kinds of employees remunerated either from the national budget or from the university budget. They may be broken down as follows:

I. Administrative personnel, which in turn may be subdivided into:

- Category A staff.
  Functions: analysis, planning and management: preparation and implementation of administrative decisions.
- Category B staff.
  Functions: supervision and implementation of decisions.
- Category C staff.
  Function: execution of specialised assignments.
- Category D staff.
  Function: execution of simple assignments.

II. Service personnel coming within the public service categories C and D.

III. Technical personnel, of the CNRS type, with indexed salaries, their own levels of recruitment and a special classification system.

IV. Contract personnel remunerated from the university budget and recruited according to the normal operating requirements of the services concerned.

It was therefore necessary to reclassify all personnel in easily identifiable categories. For this purpose, the public service classification was used.

Taking as a criterion the diplomas required and the starting index of the function concerned, we classified in the corresponding public service category auxiliary medical staff, CNRS-type staff and contract staff remunerated from the university budget.

ANNEX 3 - 2

LIST OF MAIN INCREMENTS AND ALLOWANCES RECEIVED BY NON-TEACHING STAFF

- Overtime worked by administrative staff (index> 304) and service personnel.
- Additional work under contract by technical personnel and administrative staff.
- Participation in research by technical personnel under contract.
- Additional work by laboratory assistants.
- Increments for special responsibilities (technical personnel, welfare officials, etc.)
- Increment for dangerous, insanitary, disagreeable and dirty work (skilled workers).
- Flat-rate allowance for certain bursary staff (junior and senior clerical staff).
- Flat-rate allowance for employees in non-specialist branches.
- Allowance for heads of economic departments.
- Footwear and kit allowance (service employees).

PART II

IDENTIFICATION OF ACTIVITIES AND CALCULATION OF ACTIVITY COSTS

CHAPTER 4

ELEMENTARY UNITS OF ACTIVITY (UEAs) AND COST CENTRES

There are normally two methods of cost analysis:

- analysis of the input-output relationships in which only the variable costs (direct costs) are calculated, the fixed costs (structural costs) being disregarded;
- a two-stage analysis:
  1. the input → activity relationship, to calculate the cost of the input combinations designed to secure a given objective;
  2. the activity → output relationship, designed to measure the level of activity and thus calculate the fixed and variable costs of the outputs and, in particular, reveal the effectiveness of the input combination.

However, it has been shown (see Chapter 2) that most university resources are permanent and limited. The university's task is to convert external inputs (as regards teaching activities, students to be trained) although they have little control over the quantity of the inputs, into final outputs (e.g. trained students), although they have little or no control over the market for the outputs.

In view of this situation, the second type of analysis seems more appropriate to the objectives of the present study. In the short term the budget control system will lay emphasis on the use of the given quantities of resources. In the long term, the optimum combinations and the structures required for handling the resources will be determined by decision analysis (this second level of analysis will not be considered until the final phase of the project).

A University's activity is highly differentiated and has mainly to be analysed in the light of the answers to such questions as:

WHO DOES WHAT?

WHY?

HOW?

The first step is therefore to study the University's overall functional organisation chart to identify the part played by each basic unit (see Chapter 2).

4.1 Definitions

Elementary unit of activity (UEA): utilisation of the smallest set of resources co-ordinated in a process designed to obtain a final or intermediate output or service (or several final or intermediate outputs or services).

Examples:

- semester demography course: utilisation of teaching resources designed to convert students with no demographic knowledge into students with a certain standard of demographic knowledge;

- OECD - CERI Convention: utilisation of resources designed to work out a method of university costing;
- management service for teaching staff: designed to service all UEAs employing teaching staff;
- document-copying service: designed to reproduce or duplicate documents for UEAs using the service.

Cost Centre: "Division of an enterprise considered as the subject of a special grouping of charges or costs"(1). A distinction is generally made between real cost centres, representing a portion of the enterprise placed under a single responsible agent and fictitious cost centres which are simple groups of costs identical in nature but not reflecting any material division of the university. All the UEAs are cost centres but it is convenient for purposes of calculations to create cost centres which do not represent any real UEA. For example, the creation of one or more "building costs" centres, covering expenditure committed in connection with the ownership, use and upkeep of premises, enables such expenditure to be broken down among the various users of the premises.

Owing to the accounting procedure used, the basic university units must be UEAs and cost centres at one and the same time, which makes it possible to determine the requisite degree of disaggregation to be aimed at. For example, a document-copying centre may be technically considered as several UEAs (photocopies, stencils, off-sets) but if the accounting data does not enable the costs of each differentiated activity to be isolated the centre will have to be considered as a single UEA (and also perhaps as a centre providing a single output, irrespective of the technique used).

Directly productive activity: activity designed to contribute to the production of a final output (or several final outputs) as envisaged by the university.

Examples:

- semester demography course;
- OECD - CERI Convention,

are directly productive UEAs (and cost centres).

Indirectly productive activity: activity designed to produce an intermediate output (or several intermediate outputs) or provide a service (or several services) for the use of other UEAs of the agent concerned.

Examples:

- management service for teaching staff;
- document copying service,

are indirectly productive UEAs (and cost centres).

Non-elementary unit of activity (UNEA): any sub-set of UEAs as defined by a criterion of classification.

Examples:

- UER: set of UEAs concerned with education, research and administration, gathered under a single responsible authority;
- degree course (filière): set of education UEAs which when obtained by a student constitutes a degree.

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(1) P. Lauzel: Comptabilité analytique - Sirey, 1971.

4.2 General typology

It emerges from these definitions that the concept of activity is connected with the concept of output but not necessarily in a bijective form. Indeed, one and the same activity may contribute to the creation of joint outputs: co-outputs, if they are on the same level of importance (administrative function, external relations function, etc... performed by the UEA "President's Office - General Secretariat") but main outputs and sub-outputs if they are on different levels (in an education UEA, the main output is the education dispensed to students but there are a number of sub-outputs such as external information, intellectual prestige, etc.). Furthermore, it is perhaps not always possible to make a very fine breakdown of the UEAs (e.g. the document-copying shop quoted above). Certain outputs may be the result of activities which are too diffuse to be determined, e.g. outputs of the "external effect" type (cultural prestige, general information, dissemination of technical progress, etc.)(1).

We therefore have to consider only two directly productive major activities:

- education;
- research,

although the outputs listed (see Chapter 8) are more numerous as we shall have to consider:

- the "information" output resulting from the main activity of certain UEAs (university broadcasting for example) or the sub-output of other activities;
- the accessory outputs derived from the transfer to the outside of services which are normally internal, e.g. the sale or donation to outside agents of computer time where a university computer is insufficiently used.

On the other hand, there will be a multiplicity of indirectly productive activities which cannot be exhaustively listed as they necessarily depend on the structure of the university concerned and the fineness of the analysis envisaged.

At most it would seem possible to classify them in categories showing:

- the service activities which will be defined with reference to the fact that the utilisation of their output by the consumer UEAs is measured or measurable. Examples are document-copying services, computer centres, laboratories, etc... This category may cover the "fictitious cost centres" representing different costs committed for a single objective although no tangible service is shown. In this way it is possible to define a "building costs" centre covering all costs relating to the existence, use and upkeep of a given building. This set of costs can be broken down among the users of the building as a function of an "activity index" which might, for example, be usable floor space (possibly qualified by a weighting factor for differences in height);
- administrative activities whose output generally takes many forms and is therefore difficult to measure and more difficult still to allocate. The administrative services will be broken down, according to the decision-making level, between:
  - . general university services;
  - . administrative services of the Units of Education and Research.

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(1) See Professor J. BENARD: "A Systematic Economic Approach to University Cost Analysis"- CERI, 6th December, 1972 - p.8.

- miscellaneous activities are all activities which do not come under any of the above categories either because their output cannot be measured or because they are not administrative.

They include a number of activities which though performed in the strict context of the university are difficult to identify (for example: special services like Radio-Sorbonne or Radio-Nanterre and other services which cannot be shown in an output accounting system in the present state of available information); or such ancillary activities as the welfare services (preventive medicine, physical education and sports, etc...).

4.3 Teaching activities

The elementary unit of teaching activity (UEAE) is the utilisation of the smallest set of resources co-ordinated in a process designed to convert students at a given level of knowledge to students at a higher level of knowledge, the acquisition of the additional knowledge being normally verified by an institutionalised proficiency control.

In the prevailing French university system this elementary unit is thus a set of lectures supervised work sessions and practical work sessions co-ordinated around a common theme.

This disaggregation cannot be taken further even if the costs could conceivably be more finely analysed as all the above elements are co-ordinated to achieve a common objective and are subject to the same proficiency control.

Nevertheless, it must be borne in mind that in certain cases, and particularly in recurrent training, the elementary unit of education activity may take more diverse forms (seminars, intensive sessions) and that the concept of an institutionalised control may be discarded.

The resources co-ordinated in a process generally consist of:

- resources which are directly assignable to the UEAE
  - work performed by teachers with differing functions (formal lectures, supervised work sessions, practical sessions);
  - use of absolutely specific installations or equipment;
- resources which are semi-directly assignable to the UEAE, i.e. resources produced by other UEAs (providing services) the use of which is measurable in physical units and whose units cost is calculated by the accounting system of the UEA providing the service. The content of this category clearly depends on the information available or likely to be available to the university. For example:
  - document-copying resources (pages reproduced);
  - data processing resources;
  - audio-visual resources (hours per cubicle);
  - laboratory resources (if an activity index exists);
  - building resources (hours of use per building);
  - libraries (if there is a system which gives a breakdown of publications consulted and lent);
  - etc.
- resources which are indirectly assignable to the UEAE, i.e. resources produced by other UEAs which are used but are not measurable in physical terms and cannot be assigned to the consumer units except by the use of more or less arbitrary

apportionment (or "proration") criteria. This category therefore includes all resources which have not been classified in the two previous categories and in particular:

. the administrative resources of the UER;

. the resources provided by the general services of the university.

4.4 Research activities

The elementary unit of research activity (UEAR) is the utilisation for a unit of time (the university year) of the smallest set of resources which can be considered as a cost centre, in order to create new knowledge.

It is difficult to speak of a coherent process owing to the wide range of methods of organising research groups and the existence of individual researchers each with his own sometimes purely subjective procedure.

From an accounting angle, the UEAR is necessarily a cost centre. To enable a research unit to be considered as such it must be possible to assign costs to it. It is therefore easy to embody research agreements or contracts, research centres and laboratories in a UEAR and it will often be possible, at the cost of considerable accountancy work, to apply the same treatment to the ERAs or Associated Research Teams (Equipes de Recherche Associée). However, informal groups and individual researchers cannot be isolated and will have to be classified by UERs in a single UEAR.

As shown above, the resources available to a UEAR include:

- direct resources
  - . the work of the researchers;
  - . specific capital resources.
- semi-direct resources
  - . supply of measurable services;
  - . premises.
- indirect resources
  - . supply of non-measurable services;
  - . use of administrative services.

4.5 Service activities

The elementary unit of service activity (UEAPS) is the utilisation of the smallest set of resources co-ordinated in a process for the production of an essentially intermediate unit of goods or service or a set of essentially intermediate goods or services with common characteristics. This unit or set of goods, this service or set of services, must have a physical unit of measurement and the services rendered to each UEA will have to be measurable.

The limit of disaggregation depends on the accounting system. It should be possible to assign direct costs to this unit and allocate to it the indirect costs of services received from other UEAs.

In this category we shall therefore find:

- document-copying services, broken down where appropriate by the nature of their work;

- computer centres;
- laboratories (science, language, etc.);
- libraries and reading rooms wherever their services can be broken down among the user UEAs (exceptional);
- any other services consistent with the above definition (e.g. mail service, telephone switchboard, etc.).

We shall also be able to add other more or less fictitious units to the organisation chart:

- a section for building costs (or several sections if premises are clearly separated) covering rents, depreciation, cost of upkeep and caretaking, cost of heating and lighting, insurance and all other charges directly entailed by the existence of the premises. The unit of measurement for the services might be the hour of occupation of the usable floor space per type of premises (depending on height, nature of equipment and other specific problems);
- where appropriate, maintenance sections covering the costs of all-purpose maintenance workshops.

The resources available to these UEAPSs will be classified in the same three categories as above.

4.6 Administrative activities (UEAA)

Logically, these activities should be classified in the above category but owing to the diversity of administrative work and the difficulty of defining its outputs it is practically impossible to find a reliable unit of physical measurement.

A university's general administrative activities are at different levels:

- the general university services which perform various global functions: general administration, accounting, staff management, logistics, scheduling, etc. Each service caters in its specific way either directly to the UEAs or through the UERs. It is impossible to define an optimum level of disaggregation in this general context. The least that can be done is to consider the services as a single entity in which case the information will be very approximate. The most is to build up a UEA office by office at the cost of considerable complication.
- the UER administrative services: it is generally advisable and not difficult to sub-divide these services according to the organisation of each UER. It is also advisable to open an account for the costs which can be allocated to a UER but cannot be assigned more accurately.
- department administrative services or other bodies below UER level. Although such bodies are infrequent this contingency must be provided for.

As they are not measurable these administrative services will have to be estimated by statistical methods (in the case of universities whose present organisation is of long standing) or by analogical criteria /For example, the costs of the staff management services will be broken down in proportion to the number of persons (or full-time equivalents) belonging to the user UEA7.

4.7 Miscellaneous activities

This category will cover:

- units of activity which are specific to the university and cannot be classified in any of the previous categories. It will normally comprise particular cases;

- units of activity from which students normally receive services but which are not directly managed by the univeristy i.e. university welfare, preventive medicine, physical education, sports services, etc. It can also include the inter-university libraries for which the university has no other data apart from the fees it receives. In the absence of any sociological studies, medical statistics and other data it seems unrealistic to hope to break down the above services except as an average per year per registered student, which means that their cost will have to be absorbed (i.e. allocated) at the final processing level without being allocated to UEAs.

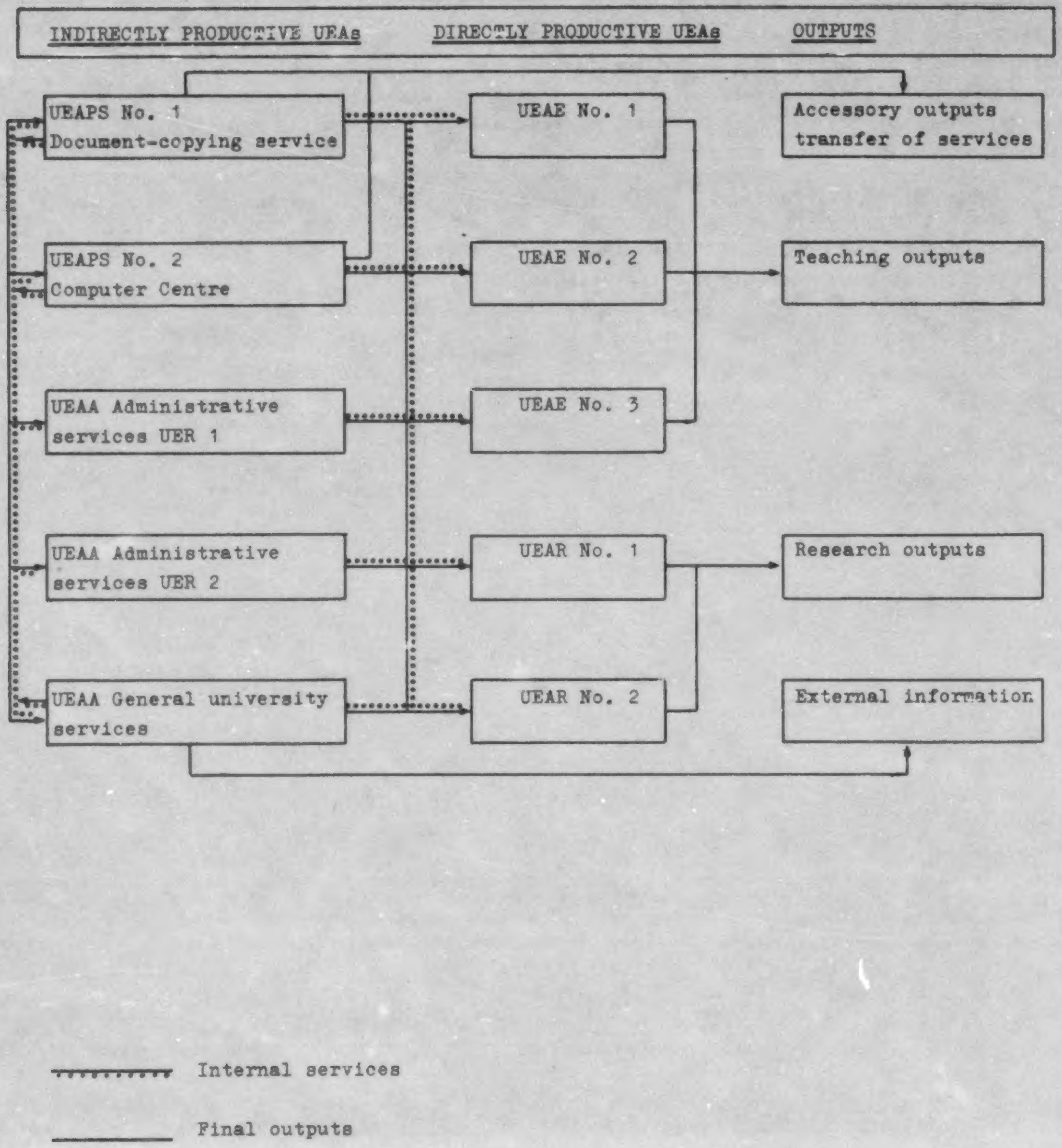
4.8 Organisation chart and files

A functional organisation chart for the whole of the univeristy (diagram No. 4.1) should emerge from this analysis, showing the flow of services among the UEAs. The considerable number of UEAs of various categories will necessitate a strict codification (generally compiled for the UEAEs) which will be sufficiently detailed to show the principle features which individualise each UEA.

The UEA files may be manual or computerised. In both cases all the resources used, directly or indirectly, must be recapitulated so as to pave the way for the calculation of the overall cost of the UEA. The files may be limited to a description of the physical factors or be combined with the cost-recording forms.

ANNEX 4.1

SIMPLIFIED CHART OF INTER-UEA RELATIONSHIPS


INDIRECTLY PRODUCTIVE UEAs
DIRECTLY PRODUCTIVE UEAs
OUTPUTS
UEAPS No. 1 Document-copying service
UEAPS No. 2 Computer Centre
UEAA Administrative services UER 1
UEAA Administrative services UER 2
UEAA General university services
UEAE No. 1
UEAE No. 2
UEAE No. 3
UEAR No. 1
UEAR No. 2
Accessory outputs transfer of services
Teaching outputs
Research outputs
External information
Internal services
Final outputs

ANNEX 4.2

SEMI-GLOBAL NOMENCLATURE OF THE UEAs

1. Code structure

The classification of the UEAs must be consistent with the accounting procedure at present in force.

A more functional classification according to principles similar to those defined under the NCHEMS "Programme Classification Structure" will be required if cost accounting is to be effectively used as a management tool.

The need to couple these two requirements will result in a numerical code which is rather cumbersome but probably difficult to reduce without sacrificing information that is essential to the task of accountancy. The code is in three parts:

- classification by UER (3 figures);
- overall functional classification (3 figures);
- detailed functional classification (variable number of figures placed on the left).

N.B. As certain partial classifications are already used in universities there may well be cases in which the third part overlaps with the first two.

1.1 UER Code

1st figure: 9 (cost accounting index)

2nd and 3rd figures: number of the UER (or the service under review) in the present accounting system of the university concerned.

1.2 Overall functional code

4th figure: nature of the activity of the UEA.

Directly productive activities:

1. Teaching.
2. Research.
3. Public service.

Indirectly productive activities:

4. Services supplied.
5. Administration.
6. Miscellaneous activities.

5th and 6th figures: semi-global functional classification of the UEAs (see table).

1.3 Detailed functional code

Specific to each university in the light of its existing or future classifications.

ORGANISATION OF THE FUNCTIONAL STRUCTURE OF DIRECTLY PRODUCTIVE UEAs

1. Teaching	2. Research	3. Public service
1.10 1st cycle	2.10 Research centres	3.10 Radio or television programmes
1.20 2nd cycle	2.20 Individual research	3.20 Placement service
1.30 3rd cycle		3.30 Associations of former students
1.31 DES (Diplôme d'études supérieures)		3.40 Publication services
1.32 3rd cycle doctorate		3.50 Instruction and training of non-students
1.33 Doctorat d'Etat		
1.39 Miscellaneous 3rd cycle		
1.40 Recurrent training		

2. Classification of UEAs

The semi-global classification should be valid for all universities. The detailed classification is given merely as an example and each university must compile its own in the light of its structure and the information it needs and can obtain.

Code	Semi-global nomenclature	Detailed nomenclature	Possible unit of work
900	General services		
900 501	President's office and general secretariat		UER Budgets
900 501 1		President's and Vice-President's offices	
" " 2		General secretariat	
" " 3		Services concerned with the the development of statistical and forecasting programmes	
" " 4		The "Loi d'Orientation", its application	
900 502	Personnel service		Number of categories of personnel (ETP) managed
" " 1		Director's office	
" " 2		General questions - teaching and research staff	
" " 3		General questions - technical, manual and service staff	
" " 4		Management of teaching staff	
" " 5		Management of administrative, technical, manual and service staff	
" " 6		Welfare	
900 503	Accounting and financial services		UER budget (including research)
" " 1		Director's office and secretariat	
" " 2		Budget questions	
" " 31		General accounts	
" " 32		Contracts and agreements	
" " 33		Revenue and available funds	
" " 34		Accounts concerning the inter-university libraries	
" " 4		Extra-budgetary questions	
" [illegible] 5		Salaries	

Code	Semi-global nomenclature	Detailed nomenclature	Possible unit of work
900 504	Division for school and university questions		Number of student enrolments
" " 1		Director's office	
" " 2		Scholarships and grants service	
" " 3		Records, testimonials and degrees	
" " 4		Transfer service	
" " 5		Equivalent foreign degrees, call-up deferments, foreign students	
" " 6		Degree and scholarship examinations	
900 405	Building, equipment and logistic division		Usable floor space of premises (allocated to the "building costs" UEAPS)
" " 1		Director's office	
" " 2		Research and programming service	
" " 3		Equipment, construction and purchases service	
" " 4		Technical service	
" " 5		Maintenance service	
" " 61		Caretaking, building 1	
" " 62		Caretaking, building 2	
" " 71		Porter's lodge, building 1	
" " 72		Porter's lodge, building 2	
" " 81		Information counter, building 1	
900 506	Service concerned with the organisation of teaching and timetables		Number of teaching hours
900 507	Information, reception and guidance service		Number of students
" " 1		Director's office	
" " 21		Student guidance service x	
" " 22		Student guidance service y	
" " 31		Information service x	
" " 32		Information service y	
900 508	Student registration service		Number of students
900 409	Administrative information service		Requires 1 special survey

Code	Semi-global nomenclature	Detailed nomenclature	Possible unit of work
900 510	Para-pedagogical service		
" " 1		Supervised work by correspondance	Number of students registered for supervised work by correspondance
" " 2		Audio-visual centre	
900 511	Joint research and publications service		Research budgets
900 312	Radio and television programmes		Output accounts
	Suppliers of services		
9xx 401	Libraries		
" " 11		Inter-university library 1	
" " 21		University library 1	
" " 31		UER 1 library	
" " 411		Department 1 library (UER 1)	
" " 9		Miscellaneous libraries	
9xx 402	Language laboratories		hours/cubicles
" " 1		Language laboratory No 1	
" " 2		Language laboratory No 2	
9xx 403	Audio-visual centre		
9xx 404	Computer centre		Computer centre minute
9xx 405	Laboratories	as required by each University	hour (?)
9xx 406	Printing, documents-copying and photocopying	" " "	
9xx 407	Mail service	" " "	Number of despatching operations
9xx 408	Telephone switchboards	" " "	Cost per phone call
9xx 409	Building cost	" " "	Square metre
9xx 410	Other suppliers of services		
901	UER No 1		
901 501	Director's office and secretariat		Number of students
901 502	Pedagogic services administration		Number of students
901 " 1		Administration 1st and 2nd cycles	
901 " 3		Administration 3rd cycle	
901 210	Research and research agreement centres		Nil

Code	Semi-global nomenclature	Detailed nomenclature	Possible unit of work
901 220	Individual research		Nil
901 110	UEAE 1st cycle	Details (6 figures) according to preceding table + nomenclature used in the university	Nil
901 120	UEAE 2nd cycle		Nil
901 130	UEAE 3rd cycle		Nil
901 509	UER expenditure which cannot be broken down Miscellaneous UEAs according to organisation of each university		Number of students

CHAPTER 5

UEA ACTIVITY INDICATORS

5.1 General concept

The measurement of the level of activity of a UEA is an important problem which must not be confused either with the level of input consumption or the level of output. Moreover, the problem varies according to whether it is approached from a long- or short-term standpoint:

- short-term standpoint: the technological processes and structural capacities are fixed and current administration is controlled by:
  . forecasts of potential output using constant technical co-efficients.
  . verification of the consumption of inputs combined in a given process to achieve a given level of activity.
  . productivity control based on the ratio of output level to activity level.
- Long-term standpoint: here the processes and capacities are variable and the objective is to determine the most effective process and adopt the necessary production capacity in the light of the decision-making criteria.

The result is that in the long-term the decision variable is a vector expressing the quantity of each input required to achieve a unit of activity. But in the short-term, this vector is considered as a constant in ex-ante terms, while any variances from the actual results provide a basis for monitoring the input consumptions. In both cases the activity variable is the number of units of process (the process being the combination of inputs required to achieve one unit of output) envisaged or actually consumed to obtain the necessary output, i.e. a scalar.

It is incidentally tempting to compare this analysis with method of homogeneous sections in private cost accounting (public cost accounting is still insufficiently developed). The UEAs are perfectly comparable to homogeneous sections being accounting groups in their function as cost centres and homogeneous with regard to their productive activity. There is even the distinction between principal sections, i.e. the directly productive UEAs and auxiliary sections, i.e. the indirectly productive UEAs.

The concept of activity indicators is thus identical to that of the "activity index" which is defined by the Plan Comptable Général Français (1957) as the "term currently applied to the standard unit used to measure all costs in a section and the portion of those costs which can be allocated to output costs".

Writers on accounting problems are unanimous in maintaining that an activity index must primarily be the quantitative expression of the activity performed by a homogeneous section, i.e. the level of application of a given process to secure a given output (the process being defined as a combination of inputs in given proportions). Secondly, the activity index should make it possible to find the global cost of the section and break it down, i.e. allocate it to the outputs.

We should therefore have to find the factor in each UEA which provides the best explanation of variations in input consumption, the variations being expressed in physical units wherever possible or otherwise in monetary units (which raises the problem of the stability of the currency).

5.2 Indicators of teaching activity

Teaching activity consists of applying to an external input, i.e., the student, a process which converts him into a final output (a student who has proved his knowledge of a given subject or a drop-out) or an input that will be processed further in the course of the ensuing period (repeater). The process is defined as a fixed combination of material inputs internal to the system. There are consequently as many possible processes as there are combinations (i.e., teaching methods) for achieving a conversion of this kind.

Certain of the inputs used are consumed in quantities which are independent of the number of students to whom the conversion process is applied (e.g. hours of formal lectures). Others (hours of supervised work) are in quantities which are a function of this number, in the context of a given process. Consequently, every process may be represented by a vector of physical quantities in which certain terms are constant and others are a function of the number of students.

Let us assume, for the sake of simplicity, that there are only four inputs, the consumption of which is measured by a physical unit:

h_1: number of hours of formal lectures

h_2: number of hours of supervised work per student

q_1: quantity of fixed material inputs

q_2: quantity of variable material inputs per student

If K is the average (or normal) size of a supervised work group,

and N is the number of students registered in the UEAE, the teaching process applied to N students is represented by the vector:

$$v(N) = \begin{pmatrix} h_1 \\ \frac{N}{K}.h_2 \\ q_1 \\ N.q_2 \end{pmatrix}$$

It is perfectly possible to divide this vector into two parts:

$$v_1 = \begin{pmatrix} h_1 \\ q_1 \end{pmatrix} \qquad Nv_2 = \begin{pmatrix} \frac{N}{K}.h_2 \\ N.q_2 \end{pmatrix} \qquad \text{with } v_2 = \begin{pmatrix} h_2 \\ q_2 \end{pmatrix}$$

If we call the input prices P_i and divide them into two vectors, i.e. P (prices of the constant inputs) and P' (prices of the variable factors) the direct and semi-direct global cost (see the definitions of these terms in chapter 6) of the UEAE can be expressed as:

$$C = P_1 \cdot h_1 + P_2 \cdot \frac{N}{K} \cdot h_2 + P_3 \cdot q_1 + P_4 \cdot N.q_2$$

in vector form:

$$C = (P_1, P_3) \begin{Bmatrix} h_1 \\ q_1 \end{Bmatrix} + N(P_2, P_4) \begin{Bmatrix} \frac{h_2}{K} \\ q_2 \end{Bmatrix} = p^t.V_1 + N.p'^t.V_2$$

(t: transposition sign).

It is therefore clear that:

- for a given number of students N there are as many costs C as there are teaching processes and the long-term decision will be to find an "optimum" cost (assuming that an optimisation criterion has been defined) by studying all the conceivable v(N);

- for a given process v(N), C is a function of N and the ex-ante budget control will be to anticipate C(N) while the ex-post control will be to note and explain the differences between the forecasts and actual results in terms of discrepancies in input quantities and prices.

N (number of students registered in the UEAE) is therefore clearly the most appropriate indicator of the level of teaching activity. However, the use of other reference units is not ruled out for statistical analysis. For example, owing to the importance of the human factor in present teaching methods, such units as the hour of lecture per student or the hour of contact per student, which are currently used in university cost analysis (Bradford, WICHE, etc...) are a by no means negligible source of information.

5.3. Indicators of research activity

In the research sector it is difficult to determine the external inputs (except perhaps the stock of preliminary knowledge) while the final outputs, although expressable in terms of quality, are difficult to quantify (see chapters 1 and 8) with our present means of investigation.

Furthermore, the inputs which are combined to conduct research activity vary considerably according to the field investigated. Between the solitary scholar engaged on literary research and the team of physicists with access to expensive laboratories and powerful computer facilities there is an infinite range of labour/capital combinations. As long as the output is not quantified the productivity of the inputs cannot be analysed.

The above points suggest that until specific research has been done to clear the ground it is an illusion to envisage the calculation of unit research costs. In this first phase of our study we shall have to confine ourselves to the calculation of the aggregate costs per UEAR.

However, there is one problem which remains to be solved: the members of the University are both teachers and researchers - and the time they spend on these two activities must be determined to enable them to allocate their remuneration. Two initial problems must be disposed of:

(1) the tasks which fall within the respective fields of education, research and administration must be clearly defined. The classification of these tasks is particularly difficult as some of them cover general activities and cannot be broken down.

(2) time devoted by teachers and researchers to each of the tasks involved must be measured, either individually and by personally (an illusion) or as an average per category. Several methods may be envisaged:

- fixing arbitrary coefficients (e.g., the coefficients used by the Ministry of Education);
- direct systematic investigation with the use of a "test diary" (see the OECD-CERI test diary and also see "Cost Finding Principles and Procedures" WICHE - 1971 page 46);
- indirect investigation among U.E.R. directors, heads of research teams, etc. (see the survey of the Catholic Univeristy of Louvain, the work currently proceeding at Paris X, annex 5.1 and Paris 1).

It must be borne in mind that the degree of reliability is not very high and that are risks of systematic bias.

However this may be, it is essential to adopt a method (the third of the above methods is certainly preferable as it is less cumbersome than the second) and apply it on a standard basis in all universities concerned as it would be disastrous to forgo a possibility of inter-university comparison for lack of a standard methodology.

5.4. Indicators of indirectly productive activities

The main feature of these activities is that their outputs are the inputs of other UEAs.

Two situations may arise:

- the unit is, or is assumed to be, in a state of full permanent use for the following reasons:

  . in case of insufficient internal use the surplus output is systematically sold outside (e.g. data processing units which sell their available computer time)

  . units whose costs are more or less fixed and whose activity and output are not measurable with the available means of information (this example largely relates to administrative units in a short-term analysis)

In these circumstances the unit activity cost is therefore a constant, subject to contingencies which are analysed by budget control. On the assumption that the productivity can be considered constant, the unit cost of the services supplied is also constant.

- the unit is subject to variations in activity the essential cause of which is the variation in demand from the users.

In both cases the overall activity is based on the combination of K inputs in order to obtain n units of output, where the quantity of each input may be a constant (cost of equipment, monthly personnel etc.) i.e. a function of a variable which can only be the activity, the output or a random variable.

In budget terms the random variables are cancelled out (as they are unpredictable) and the technical coefficients are assumed to be constant, from which it results that the activity is proportionate to the output.

In these circumstances it is possible to divide the K inputs into K_1 inputs which are constant and K_2 inputs which are proportionate to output. The global cost of the unit activity may therefore be expressed as:

$C(n) = A_1^t\ P_1\ +\ n\ A_2^t\ P_2$

Where A_1^t is the row vector of the quantities of fixed inputs;

P_1 is the column vector of the prices of the fixed inputs;

A_2^t is the row vector of the unit quantities of variable factors;

P_2 is the column vector of the prices of variable factors;

n is the number of units of the activity indicator.

In retrospective terms, such assumptions cannot be maintained and the budget comptroller will have to break down the real cost by a formula which may be:

$C' = A'^t_1\ P'_1\ +\ \alpha n\ A'^t_2\ P'_2$

where α is a coefficient of performance, i.e. the ratio of real activity to forecast activity for one and the same output, which makes it possible to carry out any comparative analysis required.

In the long term, however, the decision-maker will concentrate on A_1 and A_2 to define the most productive combination.

N.B.: In the case of administrative activities where n is not measurable the formula will be reduced to:

$$C = A^tP$$

focussing on the assumption that the UEAA costs are considered to be fixed.

ANNEX 5.1.

SURVEY ON THE TIME BUDGET OF TEACHING STAFF, UNIVERSITY OF PARIS X

I. Do you know of any rule enabling the hours of service of teachers in your special subject to be broken down into research, teaching and administrative activities?

If so, which?

Please state the source.

- what do you think of it?

II. In order to determine the actual time budget of teaching staff we ask you to give your personal estimate of the way teachers in your special subject allocate their working time.

We have prepared three forms each of which covers a category of full-time teachers employed by the University:

A - professeurs, maîtres de conférence, chargés d'enseignement (humanities) and chargés de cours (law and economics)

B - maîtres-assistants

C - assistants

Would you be prepared to complete a form yourself in your capacity as Director of a UER or a Department?

Below is a list of the activities among which teachers may divide up their working time:

(1) First and second-cycle teaching, i.e.,
  - lectures, supervised work
  - laboratories, organisation of surveys or practical training
  - supervision of students' monographs
  - preparation of lectures, cyclostyled lecture notes for students, text books
  - marking, controls
  - miscellaneous (please specify).....

(2) Third cycle teaching, i.e.
  - seminars
  - preparing students for the Certificat d'Aptitude Pédagogique à l'Enseignement du Second Degré and the Agrégation
  - supervision of thesis

(3) Research:

  - connected with teaching (individual)
  - fundamental and applied (frequently collective)

(4) Administrative activities:

  - in the UER
  - in the University
  - at the Ministry of Education

(5) Other activities:

  - consultative work
  - editing of publication and reviews

(6) Travel

As our study is concerned with the functioning of a university working time would also have to be brcken down as between activities financed by the university (national budget and university budget) and those financed by any other bodies.

CHAPTER 6

ACCOUNTING PROCEDURE FOR CALCULATING AGGREGATE U.E.A. COSTS

This chapter is solely concerned with defining the method of calculating retrospective costs reflecting an ex-post situation irrespective of whether that situation is normal or whether it reflects anomalies arising from circumstances which can be adjusted or corrected.

The operation may be divided into three stages:

1. Assignment of direct costs to the U.E.A.s
2. Assignment of the U.E.A.P.S. costs among the beneficiary U.E.A.s
3. Apportionment of indirect costs

6.1 Assignment of direct costs to U.E.A.s

All university costs described in Chapter 3 have to be assigned to all U.E.A.s except costs expressly relating to students (university welfare schemes, implicit costs borne by students and their families, etc.) which will not be taken into account until they are re-aggregated in the form of output costs (see Chapters 9 and 10).

Cost assignment should be based solely on real and reliable criteria but it is obvious that many charges, by their very nature, cannot be reliably ascertained and entail the use of less accurate criteria. These may be:

- charges estimated to be proportionate to a measured physical unit of consumption (water, gas, electricity, provided there are sufficient meters);
- charges assumed to be proportionate to a type of physical consumption which though measurable is only estimated by sample survey (sample survey of paper consumption);
- charges assumed to be proportionate to a capacity (electricity expenditure assumed to be proportionate to the installed capacity, heating charges allocated in proportion to the number of radiator elements);
- charges which are apportioned by arbitrary proration criteria when no consumption analysis is possible. This method should be avoided whenever possible in order to limit arbitrary evaluations.

6.1.1 Cost of state-remunerated staff

Staff distribution is generally quite clear from the organisation chart.

6.1.1.1 For full-time teachers

- The teaching schedule is known
- It may be assumed that the proportion of time devoted to research and administrative tasks has been globally estimated by a time-budget survey

- Chapter 3 has defined the remuneration to be taken into account in respect of each teacher.

The calculation will be different according to whether salaries are individualised or grouped by categories.

(a) Salary costs are individualised:

For example: R_i: annual remuneration of teacher i (including all social and fiscal charges) in respect of a normal service schedule (including research increment).

S_i: remuneration for additional teaching

T_i: remuneration for special research

x,y,z: average proportions of the time of the category of teachers to which i belongs devoted to teaching, research and administration $(x + y + z = 1)$

n_i: normal teaching service calculated as a number of semester equivalents

n'_i: additional teaching service, calculated as a number of semester equivalents

k: number of semester equivalents in the U.E.A.E. considered.

Two cases may be envisaged according to whether or not additional teaching service is equated with the teaching service of outside auxiliaries.

cost to be allocated to:	additional teaching service equated with teaching by outside auxiliaries(1)	no distinction between normal service and additional service
each U.E.A.E. of normal service	$k \frac{R_i.x}{n_i}$	$k \frac{R_i x + S_i}{n_i + n'_i}$
each U.E.A.E. of additional service	$k \frac{Si}{n'_i}$	
all U.E.A.R.s concerned	$R_i y + T_i$	$R_i y + T_i$
the U.E.A. concerned	$R_i z$	$R_i z$

(1) Of course this method is only conceivable in universities where there is a precise description of the normal service.

(b) Salary costs are calculated by teacher categories

e.g.: R': annual remuneration of the category, including all additional remunerations and fiscal and social charges

n': average number of semester equivalents worked (normal or additional)

x,y,z: as above.

Distribution of costs: $k\frac{R'x}{n'}$ per U.E.A.E.

$R'y$ for the U.E.A.R.s

$R'z$ for the U.E.A.A.

N.B.: the costs thus calculated are smoothed as shown in Chapter 11.

6.1.1.2 Part-time teachers

(associated part-time teachers, lecturers (chargés de cours), and staff responsible for practical work, etc...)

As these teachers are not assumed to be responsible for research or administrative duties the total cost of their remuneration is allocated to the U.E.A.E.s in which they teach.

6.1.1.3 Non-teaching staff

Generally speaking each person is allocated to a single U.E.A. in which case his remuneration is entirely assigned to the U.E.A. But there may be special cases where one and the same person shares his time among several U.E.A.s. It would then be advisable to make a statistical analysis of the hours worked by each person in order to ensure that the assignment is realistic.

6.1.2 Operating costs

The university budget and accounting services are strictly regulated. Operating costs are shown by categories and a functional classification is superimposed (with a breakdown by U.E.R.s and equated services).

The rules for cost assignment are listed below. It will be noted that the idea of expenditure has been replaced by the idea of committed costs (i.e. commitment accounting instead of payment as practised in the public service)

- Current supplies are treated in terms of consumption rather than purchases, so that: consumption = purchases + stock depletion - stock increases.

A voucher system should enable any required assignment to be made.

- Staff costs plus all salary-related taxes are treated on the same lines as the costs of state-remunerated staff.
- The other costs broken down in the functional classification accounts will be disaggregated as far as possible. This is important as regards general service charges in which it is essential to determine the cost of premises accurately and less important as regards U.E.R. charges of which only a few specific items may be assigned to the U.E.A.E.s and research teams, the remainder being assigned (necessarily) to the administrative services of the U.E.R.s as joint charges.
- The accounts earmarked for "depreciation appropriations" and "other budget expenditure" will be disregarded. In the first case the method of calculation used in the present study is not the official method while the second case concerns capital expenditure only and this does not fall within the category of charges.

6.1.3 Capital costs

Under an accounting system based on positive costs capital costs will be equated with depreciation, as described in Chapter 3. The types of fixed capital entailing depreciation costs are mainly:

- premises and their fixtures and fittings,
- equipment and furniture, whether or not they are allocated to specific premises.

6.1.3.1 Necessary information

(1) File describing buildings (see Chapter 2, Annex 2.2)

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(2) File describing premises and their utilisation (see Chapter 2, Annex 2.4)

(3) File providing an inventory of movable goods, classified in three categories:

- equipment and furniture permanently allocated to specific premises;
- equipment and furniture not permanently allocated to specific premises but to a U.E.A. (e.g. vacuum cleaners for use in a specific building, car attached to the President's office, etc.);
- equipment and furniture not permanently allocated to premises but to a group of U.E.A.s (e.g. mobile overhead projector available for particular courses).

Apart from the necessary physical data these files should supply the following basic accounting data:

- date and cost of purchase (or date and result of valuation),
- annual updating of the cost of the purchase or replacement value,
- period of depreciation,
- successive annual depreciation payments.

6.1.3.2 Accounting procedure

(1) The proposed criterion of apportionment is the square metre of usable floor space which may be given a weighting coefficient in the case of premises with an abnormally high ceiling (amphitheatres). Additional areas, vestibules, corridors, etc. are not included in the accounting system as they are directly covered by building costs and apportioned to the U.E.A.s proportionately to their area.

(2) There are as many building cost accounts as there are categories of premises. Each covers the following direct costs:

- depreciation or rent (real or fictitious);
- cost of maintenance and caretaking staff;
- cost of maintenance and caretaking;
- heating costs;
- lighting costs;
- insurance;
- any other charges directly arising from the existence of the building.

It is therefore possible to calculate a cost per square metre of usable floor space or each type of building available to the university.

(3) An account is opened for each set of premises or category of premises if there are several which have the same area and layout and are used for the same purpose (e.g. classrooms jointly used for supervised work).

The following items are assigned to this account:

- its quota of building costs proportionate to the area of the premises;
- depreciation allowances for movables permanently allocated to the premises;
- any costs specific to the premises.

N.B.: This simple system under which heating and electricity costs are apportioned in proportion to usable floor space is therefore a rough and ready criterion. It can be refined upon by passing the heating and electricity costs through special accounts and apportioning them to the building accounts on the basis of other criteria, e.g. the number of radiator elements or hot-air vents in the case of heating and the installed capacity in the case of electricity.

(4) Building accounts are divided among the U.E.A.s which occupy the premises concerned:

- entirely, where the occupation is permanent;
- in proportion to the period of occupation, where the premises are shared (amphitheatres, rooms used for lectures or supervised work...) including occupation by outside bodies (accessory output).

The problem which then arises is the rate of utilisation. Either the premises are sufficient for the requirements of the university and do not represent a scarce factor or they are more or less inadequate and any spoilage must be penalised. Admittedly this problem is not important where positive historical costs are concerned as the latter are only a reflection of the situation but it arises where costs are smoothed or normative (see chapter 11) and involve the concept of normal or optimum utilisation of premises. It would seem that this problem cannot be solved satisfactorily unless there is a model for the allocation of premises(1).

This difficulty might be overcome by an alternative procedure under which the activity index adopted in the case of shared premises (necessarily assumed to be teaching premises) would be one hour's occupation. This unit would be weighted according to the number of students concerned. In the case of classrooms used for practical and supervised work where the groups of students are more or less the same size this solution would involve little change but where amphitheatres are concerned it introduces a criterion which eliminates the incidence of errors in the allocation or the choice of premises.

(5) Depreciation allowances for movables not permanently allocated to specific premises are apportioned to U.E.A. accounts in proportion to the time they are used by each U.E.A. (time observed or estimated according to available information).

6.1.3.3 Brief numerical example

Let us take the example of a university whose buildings include the following premises:

- 1 amphitheatre with seating for 800 (600 sq. metres, coefficient 2);
- 1 amphitheatre with seating for 300 (300 sq. metres, coefficient 1.5);
- 5 identical classrooms for supervised work (each 40 sq. metres);
- 1 office for the Director of U.E.R. No. 1 (30 sq. metres);
- 2 student registration offices for U.E.R. No. 1 (70 sq. metres combined);
- 1 unit of premises allocated to the U.E.R. research centre (60 sq. metres).

Their annual cost and utilisation may be summarised as follows:

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(1) In this connection see the HIS Model, in K.M. HUSSAIN and H.L. FREYTAG - Resource, Costing and Planning Models in Higher Education - Verlag Dokumentation Pullach bei München - 1973.

Premises	Depreciations for premises(1)	Depreciations for equipment and furniture(3)	Proportion of costs (2)	Total costs	Total hours per year of utilisation	of which	
Amphi 800	60 000	8 200	43 200	111 400	1 200	1.01	80 H
						1.02	40 H
						1.03	40 H
						1.04	40 H
						1.06	40 H
Amphi 300	22 500	4 000	16 200	42 700	1 500	1.05	40 H
Classrooms for supervised work	2 000	460	1 440	3 900	6 500	1.01	810 H
						1.02	400 H
						1.03	410 H
Office of director-UER 01	1 500	1 200	1 080	3 780	full-time	-	-
Student registration office	3 500	2 140	2 520	8 160		-	-
Premises for research centre	3 000	2 000	2 160	7 160		-	-

N.B. (1) Depreciations for premises as a whole are divided by the number of weighted square metres of usable university premises i.e. Frs.50 per weighted square metre in the present case.

(2) The cost of water, electricity, heating, maintenance, insurance, caretaking for the university as a whole which is assumed to be installed in a group of homogeneous buildings represents Frs.36 per usable weighted square metre.

(3) Depreciations for equipment and furniture allocated permanently to each unit of premises are calculated individually. Example: Office of the Director of U.E.R.1:

Equipment	Present cost	Period (Years)	Depreciation
2 cupboards	900	10	180
1 filing cabinet	600	10	60
1 director's desk	700	10	70
1 secretary's desk	500	10	50
2 armchairs	400	10	80
4 chairs	100	10	40
1 typewriter	3 600	5	720
Total			1 200

		U.E.R. No. 1 covers the following U.E.A.s
Administration:	901 - 501	Director's office
	901 - 502	Student registration office
Research:	901 - 200	Research Centre
Teaching (600 Students):	901 - 101	Year's course with 24 supervised work groups
(600 Students) :	901 - 102	Semester course with 24 supervised work groups
(600 Students) :	901 - 103	Semester course with 24 supervised work groups
(600 Students) :	901 - 104	Semester course with no supervised work
(200 Students) :	901 - 105	Semester course with no supervised work
(400 Students) :	901 - 106	Semester course with no supervised work

U.E.R. No. 1 also has an overhead projector (current value Frs.3,000 amortizable over 5 years) used as follows:

901 - 101:	60 h
901 - 102:	40 h
901 - 104:	20 h
901 - 106:	40 h
Total:	160 h

(1) Allocation of Capital costs in proportion to floor space

901 - 501	Director's office:	3 780
901 - 502	Student registration office:	8 160
901 - 200	Research centre:	7 160
901 - 101	$\left(\frac{111\ 400}{1\ 200} . 80 + \frac{3\ 900}{6\ 500} . 810 + \frac{600}{160} . 60\right) =$	8 138
901 - 102	$\left(\frac{111\ 400}{1\ 200} . 40 + \frac{3\ 900}{6\ 500} . 400 + \frac{600}{160} . 40\right) =$	4 103
901 - 103	$\left(\frac{111\ 400}{1\ 200} . 40 + \frac{3\ 900}{6\ 500} . 410\right) =$	3 959
901 - 104	$\left(\frac{111\ 400}{1\ 200} . 40 + \frac{600}{160} . 20\right) =$	3 788
901 - 105	$\left(\frac{42\ 700}{1\ 500} . 40\right) =$	1 139
901 - 106	$\left(\frac{111\ 400}{1\ 200} . 40 + \frac{600}{100} . 40\right) =$	3 863

(2) Allocation in proportion to the number of student hours

This solution does not change the calculation except in the case of the amphitheatres as the supervised work rooms are assumed to be identical.

In addition to the previous data the number of student hours has to be calculated for each amphitheatre.

Premises	Overall utilisation	Utilisation by U.E.R. 1
Amphi 800	600,000 student hours	136,000 student hours
Amphi 300	320,000 student hours	8,000 student hours
Total	920,000 student hours	144,000 student hours

The average cost per student hours of amphitheatre is:

$$\frac{111,400 + 42,700}{920,000} = 0.1675$$

The capital costs for the U.E.A.E.s are therefore as follows:

- 901 - 101: $(0.1675 \,.\, 80 \,.\, 600 + \frac{3\,900}{6\,500} \,.\, 810 + \frac{600}{160} \,.\, 60) =$ 8 751
- 901 - 102: $(0.1675 \,.\, 40 \,.\, 600 + \frac{3\,900}{6\,500} \,.\, 400 + \frac{600}{160} \,.\, 40) =$ 4 410
- 901 - 103: $(0.1675 \,.\, 40 \,.\, 600 + \frac{3\,900}{6\,500} \,.\, 410) =$ 4 266
- 901 - 104: $(0.1675 \,.\, 40 \,.\, 600 + \frac{600}{160} \,.\, 20) =$ 4 095
- 901 - 105: $0.1675 \,.\, 40 \,.\, 200 =$ 1 340
- 901 - 106: $(0.1675 \,.\, 40 \,.\, 400 + \frac{600}{160} \,.\, 40) =$ 2 830

As compared with the previous method, this solution clearly reduces the incidence of using premises too big for the number of students occupying them and increases the cost of premises utilised to full capacity. This solution is therefore logical if the premises available are considered as a constraint and if it is estimated that their occupation is an optimum one. If this is not the case the advantage of the first solution is that it prompts universities to improve their space management.

6.2 Treatment of semi-direct costs

At the conclusion of the allocation stage some dissatisfaction may logically be felt on examining the significance of the direct costs obtained, since:

- the directly productive U.E.A.s have been assigned nothing more than staff costs, and this is quite inadequate for any kind of analysis.
- practically all operational costs will be shown in the accounts reserved for general services, U.E.R. administrative services and costs in respect of premises.
- the only accounts likely to be realistic, except as regards overheads costs and costs in respect of premises, are those of the service U.E.A.s. But as these U.E.A.s are defined by the fact that the use made of their outputs is accurately known, it would seem worthwhile calculating the direct cost of these outputs. This direct cost will be considered as a minimum internal transfer price, except of course if the university concerned has already adopted an internal pricing procedure as part of a definite policy (as in the case of the data processing services of the Catholic University of Louvain). In the absence of a policy of this kind which would incidentally mean having income statements for each U.E.A. and is hardly compatible with the present management of French universities, it is interesting to make a preliminary sub-apportionment of direct costs, allowing for reciprocal services, from the service U.E.A.s to the U.E.A.s which use their services. The users would thus ascertain the proportion of costs which can be

calculated as a practical certainty and which we will call semi-direct costs. It is worth noting that this gives the cost of transfers outside the university (hiring out or loaning of premises, sale of computer time, etc.) for which accessory output accounts have to be opened as in the following example:

Example of calculation:

Activity and direct cost of service U.E.A.s

U.E.A.P.S.	Direct costs	Unit	Output		Beneficiaries			
				Premises	Doc. Copying	Computer	Other U.E.A.s	Outside
Costs in respect of premises	300 000	Weighted/ sq. metres	5 000	100	200	200	4 000	500
Document copying	181 476	Sheet of paper	1000 000	10 000	-	50 000	940 000	-
Data-processing	100 000	Minute of computer time	100 000	-	-	-	90 000	10 000

N.B. The university has lent or leased 500 sq. metres of premises per year to outside bodies and has sold 10,000 minutes of computer time.

Using the letters x, y, z to represent the semi-direct global costs of the three service U.E.A.s we have the following equations:

$$\begin{cases} x = 300\,000 + \dfrac{10\,000}{1\,000\,000}\,y + \dfrac{100}{5\,000}\,x \\ y = 181\,476 + \dfrac{200}{5\,000}\,x \\ z = 100\,000 + \dfrac{200}{5\,000}\,x + \dfrac{50\,000}{1000\,000}\,y \end{cases}$$

N.B. Self-service, i.e. the proportion of their own services consumed by U.E.A.s, must be taken into account.

The solution of the equations is:

$$\begin{cases} x = 308,100 \\ y = 193,800 \\ z = 122,014 \end{cases}$$

The unit costs amount to:

Frs.61.62 per weighted sq. metre per year

Frs.0.1938 per copied sheet

Frs.1.22014 per minute of computer time

The breakdown per user will be:

	Other U.E.A.s	Cost of accessory outputs (Transfers to outside)
Premises	246 480	30 810
Document copying service	182 172	-
Computer Service	109 812.60	12 201.40
	538 464.60	43 011.40

The total costs distributed to the other users (Frs.581.476) are equal to the direct cost of the service U.E.A.s.

Mathematical formulation:

(1) General solution: There are n U.E.A.P.S.s, $i \in \left\{1, \ldots i \ldots n\right\}$

Let Ci be the direct cost of U.E.A.P.S.i

n_i: number of units produced by U.E.A.P.S.i

n_{ij}: number of units consumed by U.E.A.P.S.j

n_{ik}: number of units consumed by the other U.E.A.k

n'_i: number of units transferred outside the university.

$$n_i = \sum_j n_{ij} + \sum_k n_{ik} + n'_i$$

The object of the calculation is to find C'_i: cost of U.E.A.P.S.i, allowing for inter-services.

U.E.A.P.S.i receives from the (n - 1) other U.E.A.P.S.j n_{ji} units of output or invoiced services -, and its semi-direct cost is therefore:

$$C'_i = C_i + \sum_j \frac{C'_j}{n_j} \cdot n_{ij}$$

or, in matrix form for the n U.E.A.P.S.s:

$$(C'_i) = (C_i) + \left(\frac{n_{ij}}{nj}\right) \cdot (C'_i)$$

the solution being: $(C'_i) = \left[(I) - \left(\frac{n_{ji}}{n_j}\right)\right]^{-1} (C_i)$

A solution may be obtained by the standard method for a system of n equations with n variables.

(2) Simplified solution:

It should be noted that if there are no reciprocal services, i.e. if the matrix $\left[(I) - \left(\frac{n_{ij}}{nj}\right)\right]$ can be arranged in triangular form the mathematical calculations can be considerably simplified. It may therefore be interesting to see whether reciprocal services cannot be disregarded at the cost of a very slight approximation (see WICHE pages 67-69). For this purpose the U.E.A.P.S.s which provide most services for the other U.E.A.P.S.s (document-copying services, for example) would have to be considered first and those which provide few services (language laboratories) would come last. When there are reciprocal services between two U.E.A.s i j the smaller of the two services may be disregarded.

Whereas the general method requires a computer as soon as there are more than five or six U.E.A.P.S.s the simplified calculations can be done manually with only a very small margin of error.

(3) Mixed solution:

The general problem may be handled in two stages:

- U.E.A.P.S.s with reciprocal services are separated from the others
- each group is handled separately: the group with reciprocal services as under (1) since it is very small and the group without reciprocal services as under (2).

Whatever the process used it is easy to calculate the semi-direct unit costs of service $\frac{C'_i}{n_i}$ and apportion C'_i to the user U.E.A.s other than the U.E.A.P.S.s (whose accounts are now closed) and to the accessory output accounts (services transferred to outside).

6.3 Apportionment (or proration) of indirect costs

In theory, the costs of the U.E.A.s we have not yet considered i.e. general services, U.E.R. administrative services and miscellaneous services, should have been apportioned on the same lines as the costs of the service U.E.A.s. They are treated separately owing to the absence of any clearly defined unit for measuring the supply of services. It is therefore indispensable to have two categories: one for activity costs based on reliable or practically reliable criteria and the other for costs calculated by processes which are often arbitrary.

As the apportionment problems for each category are not identical each must be studied in detail.

6.3.1 Apportionment of general service costs:

As administrative activity is not an end in itself, administrative output must be considered as an intermediate output.

The degree of disaggregation of general service in U.E.A.s is left to the discretion of each university in the light of its own organisation and methods of data collection and processing.

The determination of apportionment criteria obviously depends on this degree of disaggregation. The greater it is the more logical the criteria will be but the more work their calculation will require.

Admittedly, the apportionment or "proration" criteria might be refined by job analysis and regression analysis but apart from problems of currency erosion this would assume that university structure remains unchanged for at least ten years.

It may be noted that in any apportionment or proration of general services, it will be possible to allow for self services and that costs will very often be absorbed by directly productive U.E.A.s through the channel of "U.E.R. costs for apportionment". Hence the need to divide up the overall problem.

N.B.: The mathematical formulation is similar to that for the U.E.A.P.S.s

6.3.2 Miscellaneous general U.E.A.s

This category contains all the services which are not attached to a U.E.R. and cannot be classified as providers of services or as general administrative services. This means that it will only contain special cases and that no standard solution can be envisaged.

Apart from the para or peri university services already mentioned whose costs are sub-apportioned to outputs we may find a number of special services. A few examples may be taken from Paris I:

- Inter-university libraries for which the university has no data except its annual revenue.

In the absence of any other global cost estimate this must be accepted, but at the present time there is no information, even statistical, on the breakdown of consultations and loans as between universities using the library services or the categories of users (students, teachers, researchers). A further problem is how to evaluate the depreciation of the library assets:

- Radio-Sorbonne: the cost of this U.E.A. is entirely assigned to the "information" output.

Similar problems will be encountered in all universities and each will have to define its own cost apportionment or assignment rules.

6.3.3 The administrative services of the Units of Education and Research (U.E.R.s)

The indirect U.E.A. costs for each U.E.R. generally cover:

- the cost of running the U.E.R.
- the cost of student registration services (this can sometimes be shown by cycles)
- the U.E.R. costs to be apportioned (particularly the general services quota).

Here again there is no logical criterion and it is obvious that the following suggested apportionment criteria are highly arbitrary:

- cost of running the U.E.R.: interview with the director of the U.E.R.

- cost of student registration services: in proportion to the number of students registered in each U.E.A.E., with a weighting factor for the period of study concerned (years or semesters)

- costs to be apportioned: certain costs lend themselves to logical criteria which can be refined upon by interviews with the teaching staff (premises for the use of teacher - researchers) but most will be arbitrally apportioned like the costs of the student registration services unless it is clear that research is included.

6.4 Summary

After the assignment of direct costs and the various proration operations, Diagram 6.1 below shows how the costs appear as a whole in the directly productive U.E.A.s, except for the portions of cost already apportioned (miscellaneous services) or absorbed (cost of services sold as accessory outputs).

In compiling the complete cost records of the directly productive U.E.A.s those which are logical i.e. the semi-direct costs must be clearly separated from those that are arbitrary, i.e. the indirect costs.

The process may be summarised as follows:

1st Stage: Assignment of the charges to all U.E.A.s

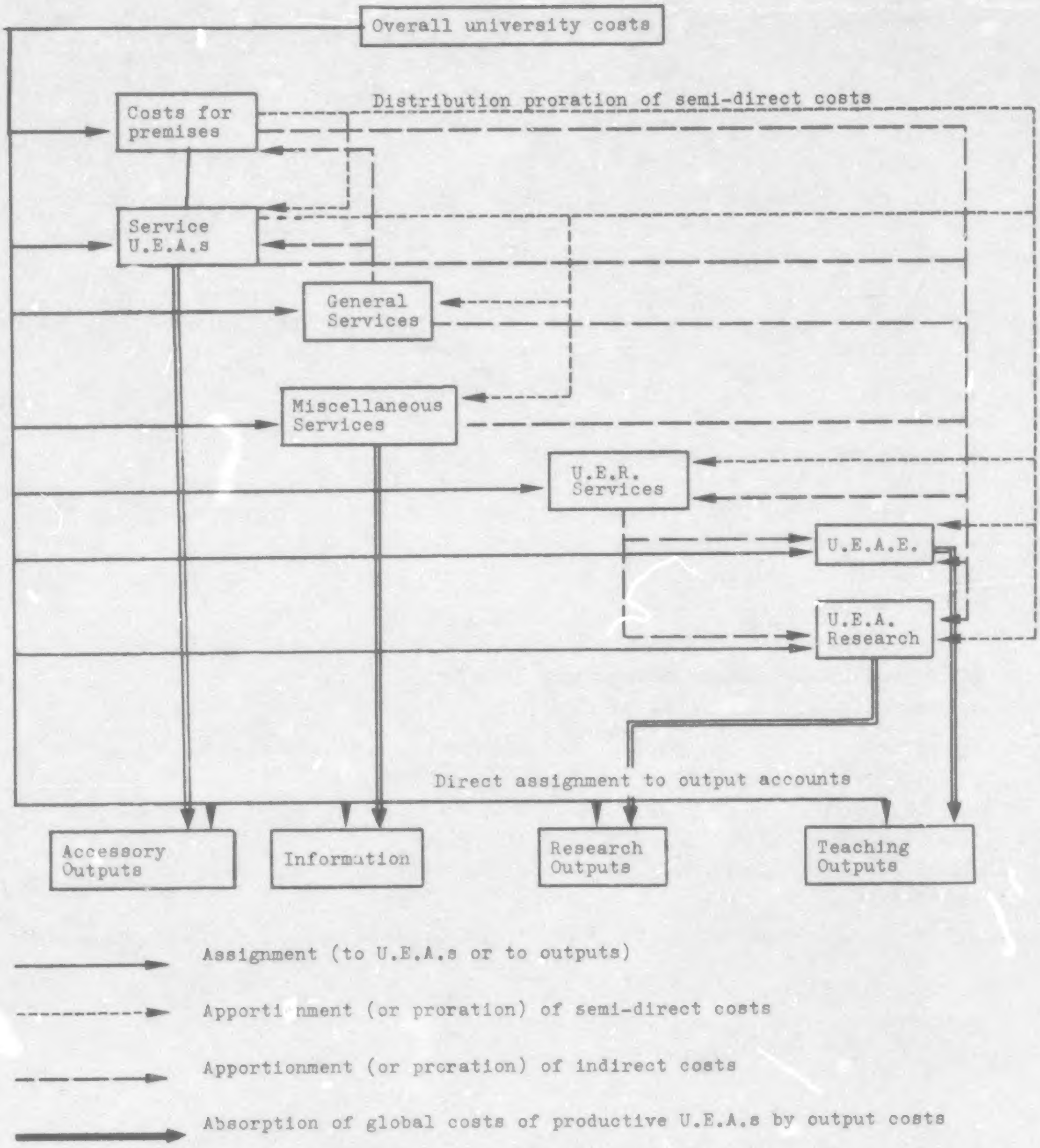
2nd Stage: Distribution of the direct and semi-direct costs of the U.E.A.P.s to all the user U.E.A.s (directly or indirectly productive)

3rd Stage: Apportionment (or proration) of the costs of the university general services to all user U.E.A.s. The indirect costs of the U.E.A.P.s which then appear are apportioned only to the directly productive U.E.A.s in proportion to the material serivices the latter receive

4th Stage: Apportionment or proration of the costs of the U.E.R. administrative services to their directly productive U.E.A.s.

DIAGRAM 6.1

COST TREATMENT CHART


Overall university costs
Costs for premises
Distribution proration of semi-direct costs
Service U.E.A.s
General Services
Miscellaneous Services
U.E.R. Services
U.E.A.E.
U.E.A. Research
Direct assignment to output accounts
Accessory Outputs
Information
Research Outputs
Teaching Outputs
Assignment (to U.E.A.s or to outputs)
Apportionment (or proration) of semi-direct costs
Apportionment (or proration) of indirect costs
Absorption of global costs of productive U.E.A.s by output costs

CHAPTER 7

UNIT ACTIVITY COSTS

The concept of unit activity costs is of course bound up with the concept of a measurement unit for UEA activity. For this reason the present chapter will deal only with the unit costs of UEAs whose activity is measurable, i.e. the teaching and service UEAs.

Mathematically, it is always possible to work out unit costs by dividing overall costs by any quantity related to the overall system which has borne the costs. In economic terms, however, it is important to realise the significance of the quotient, since causality takes precedence over correlation. Hence the close link between calculation and analysis.

The present chapter is concerned with positive costs. It must be borne in mind that as far as possible the latter reflect the actual situation and particularly its anomalies. Caution will therefore be necessary in making place and time comparisons and the reasons for any anomalies will have to be taken into account (see Chapter 11 for a closer analysis).

7.1 Unit costs of teaching activity

7.1.1 Mathematical notations:

For a UEAF i:

n_i: number of students registered for courses

c_i: cost directly allocated

$C'_i = C_i + \sum_k n_{ki} P_k$: semi-direct cost (direct cost plus semi-direct cost P_k of n_{ki} services received from UEAPS k)

K_i: total indirect costs received in respect of the general administrative and UER services ($C''_i = C'_i + K_i$, is the total UEAE cost)

The distinction between fixed and variable costs would give the following:

$C'_i = F_i + n_i\ v_i$

F_i = semi-direct global fixed cost ($p^t \times V_1$)

V_i = semi-direct variable unit cost: ($p'^t \times V_2$).

7.1.2 It is useful to determine the following costs for any given UEAE:

(a) Total cost per student registered for the course: $\frac{C''_i}{n_i}$

This is exlusively an accounting cost and hardly lends itself to comparisons as it reflects anomalies, economies or diseconomies of scale (absorption of fixed costs) and the arbitrary lines on which indirect costs are apportioned.

(b) Semi-direct cost per student registered for a course: $\frac{C'_i}{n_i}$

which eliminates the influence of the administrative costs and must be regarded as the cost of the teaching resources. Geographical comparisons (intra or inter-university comparisons between comparable subjects and levels) or time comparisons (relating to the same UEAE) are particularly rewarding provided the anomalies are carefully taken into account.

(c) Semi-direct variable cost per student registered: V_i, which eliminates the problem of the rate of absorption of fixed costs and facilitates any comparisons. Furthermore, this cost may be equated with a short-term marginal cost within the limits of the available student capacity.

It may also be interesting to calculate special university costs with reference to special units for the measurement of activity:

(d) Semi-direct cost per teaching hour per student $\frac{e}{k_i} \times \frac{C'i}{n_i}$ where k_i is the number of hours of formal lectures and practical work in respect of a course i. This unit cost lays emphasis on the human factor in the teaching process. The only meaningful comparisons are between UEAEs where teaching methods are comparable.

(e) Semi-direct cost per student contact hour. $\frac{e}{e_i} \times \frac{C'i}{n_i}$ where l_i is the number of contact hours between teachers and students (hours of teaching + hours spent by teachers interviewing students outside lectures and supervised work periods). This cost which is a very fashionable concept in the Anglo-Saxon countries is unfortunately less meaningful in French universities where these contacts are far from being institutionalised.

(f) Cost per registered student of the use of service k bv UEAE i: $\frac{n_{ki}\ P_k}{n_i}$

These special costs (cost per student in respect of premises for course i, cost of documents per student in course i, ...) may yield particularly interesting information on the use of intermediate assets, on any spoilage and on the teaching methods used.

7.1.3 For any given teaching UNEA, i.e. for a set of UEAEs grouped together on the basis of a particular criterion of homogeneity, it is interesting to calculate average costs. These averages do in fact make it possible to smooth any anomalies peculiar to a given UEAE and they are consequently a more reliable source of comparison.

There is no question of listing all the possible groupings here as they are innumerable and their significance often depends on the specialisation or de-specialisation of the university concerned, but the most generally useful are:

(a) Average semi-direct cost per student in a discipline: the discipline may be represented as the group p UEAE i and the average cost is:

$$\bar{a} = \frac{\sum_p c'_i}{\sum_p n_i}$$

This average may be refined upon by taking teaching cycles or levels into account.

(b) Semi-direct costs per student in a complete university course (filière), the latter being, in the strict sense of the word, a set of s credits which go to make up a degree. The semi-direct cost of this particular university course will be:

$$b = \sum_{p} \frac{C'_{p}}{n_{p}}$$

This aggregation is closely related to the idea of output costs, in the sense that it represents the minimum semi-direct cost of a degree (minimum as repeaters and dropouts are assumed to be excluded) on the basis of a given list of options. The comparison between the different courses leading to one and the same degree is obviously very important.

(c) Variable cost per student working through a university course: $c = \sum_{p} v_{p}$ where c represents the marginal cost of registration for a given course for which all UEAEs have available capacity.

(d) Average semi-direct cost per student for courses leading to the same degree.

The problem is to define the type of average to be used and two solutions are possible:

- average weighted by the number of students registered in a year in each university course t:

$$\bar{d} = \frac{1}{\sum_{t} n_{t}} \cdot \sum_{t} \sum_{s} n_{st} \frac{C'_{st}}{n_{st}}$$

$$\bar{d} = \frac{\sum_{t} \sum_{s} C'_{st}}{\sum_{t} n_{t}}$$

Apart from the fact that information concerning the direction taken by students in the course of their studies is difficult to obtain it is well to note that any breakdown of the student body by courses (and particularly optional courses and minor credits) varies considerably from one year to another for reasons which are often irrational (e.g. unfounded rumours regarding the marking system used by a particular teacher).

- a non-weighted average for t university courses,

$$d' = \frac{1}{t} \sum_{t} \sum_{s} \frac{C'_{st}}{n_{st}}$$

may be more meaningful than the previous average although it does not allow for the permanence of certain predominant choices.

(e) Average variable cost per student on a rumber of university courses leading to the same degree, in which we find the same problems as above.

(f) Average cost of the UEAEs in the same UER and/or the same cycle (the UEAEs being weighted by the number of semesters) involving the same teaching resources. For example, any comparison between courses with or without supervised or practical work is ruled out. The problem of averages arises as under (d) but its interpretation is of course different as the reasons given for the divergencies no longer exist.

This list could be continued indefinitely for other groupings, complete costs (including overhead costs) and other units of measurement (hour of teaching x students). In this connection it is not unrewarding to consult "Cost-finding Principles and Procedures" - National Center for Higher Education Management Systems at WICHE - November 1971 (Appendix F: Unit costs).

7.2 Unit costs of service activities

In the absence for the time being of a system of normative references, the predominant information concerning U.E.A.P.S.s is their intermediate output and the first unit cost to be considered is obviously:

(a) The semi-direct cost per unit of output as defined and calculated in Chapter 6 (6.2 mathematical formulation).

The apportioned administrative costs (see Chapter 6.3) can also be easily added to the foregoing in order to obtain the:

(b) Complete cost per unit of output

If further analyses are desired, use may be made of performance indicators or indicators showing the full utilisation of the dominant input e.g.

if the dominant input is work:

- quantity of output per employee;
- quantity of output per employee/hour,

if the dominant input is equipment:

- quantity of output per hour of equipment utilisation;
- rate of utilisation of equipment (real time/potential time), this analysis being particularly useful in laboratories (language or scientific laboratories using heavy equipment) or computer centres.

If there is also an independent accounting system which enables cost variations to be analysed it will be possible to calculate the costs of full utilisation (or costs of rational allocation of fixed charges).

7.3 Provisional conclusions

It emerges from this chapter that the analysis of retrospective costs is instructive but limited:

- because it does not enable reference to be made to any norms;
- because it reproduces existing structures and does not enable the consequences of any alteration in these structures to be considered.

For these reasons the approach adopted will be comparative cross-section or time analysis but there is no question of using this method to derive basic information for budgetary control and still less for decision-making.

PART III

A PRELIMINARY APPROACH TO OUTPUT COSTS

CHAPTER 8

INDENTIFICATION OF UNIVERSITY OUTPUTS

The transition from the analysis of university activity to the analysis of university outputs calls for a precise definition of these outputs. We will consider the final outputs only i.e. those which are or can be used by agents other than the university either on a market (labour market for students leaving the university) or irrespective of the organised market (knowledge made available to the community).

The traditional functions of any university suggest the following categories:

- teaching outputs
- research outputs

to which we will add the categories:

- public service
- accessory outputs (transfers of intermediate outputs)

8.1 Teaching outputs

The objective of teaching activities is to convert a student with a given level of knowledge into a student with a higher level of knowledge i.e. a certain number of units of verified knowledge which represents a degree.

But:

- a degree may be obtained through a large number of different university courses (optional subjects)
- every student encounters successes and setbacks

If we start from the assumption that the activity expended to train a student entails the same costs whatever the result of the examination, i.e. success or failure, we may say that every student considered as a final output i.e. graduating to a higher cycle or leaving the university, has a cost individualised by his choice of optional subjects and his failures. A system of information of this kind obviously requires a file showing each student's individual university career. Chapter 10 (10.1) will show the accounting use which can be made of this file to ascertain not only the costs of the final outputs; - graduates

- drop-outs
- leavers

but also the costs of the intermediate outputs i.e. all students who are undergoing training and have not stated their intention of leaving the university.

Two problems arise at this point:

8.1.1 Extent of disaggregation of degrees

The degrees awarded by universities may be classified according to two criteria:

(1) by level:

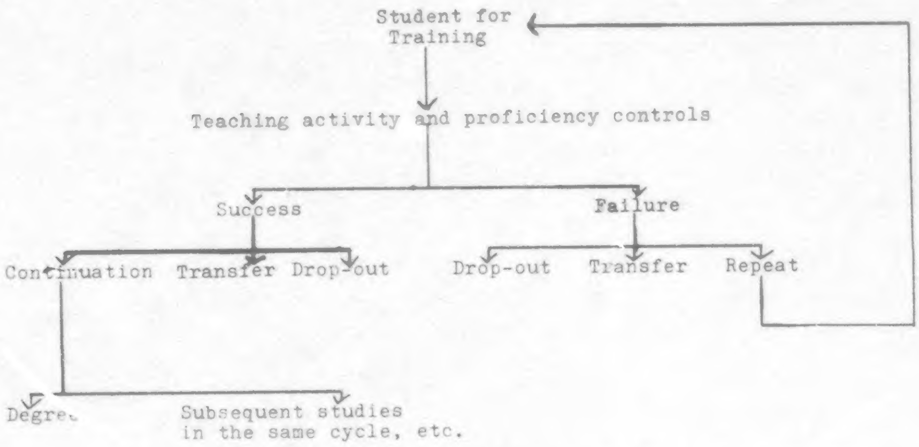
- 1st-cycle Degrees, e.g.: Diplôme Universitaire d'Etudes Littéraires (D.U.E.L.)
  - Diplôme Universitaire d'Etudes Scientifiques (D.U.E.S.) (replaced since 1974 by a single Diplôme d'Etudes Universitaires Générales ou D.E.U.G.).
- 2nd-cycle Degrees: Licence et Maitrise
- 3rd-cycle Degrees:
  - Diplôme d'Etudes Supérieures
  - Diplôme d'Etudes Approfondies
  - Doctorates
  - Diplômes d'Instituts
- Miscellaneous: preparation for the qualifying certificate for teachers in secondary or technical schools, preparation for the "agrégation" (competitive state examination) etc.

2. by discipline:

Can it be said that a degree in economics with econometrics as an optional subject is identical to a degree in economics with development economics as an optional subject? The answer is no, not only because the inputs are somewhat different but because the labour market does not consider the two optional subjects to be equivalent. But in that case, how far should a degree be disaggregated? One and the same optional subject may be made up of different credits. Disaggregation to this level seems somewhat excessive and we therefore propose that degrees should be defined on the basis of the institutionalised options, considering that at labour market level employers are not sensitive to closer definitions.

8.1.2 Success and failure

The result of the activity of a U.E.A.E. applied to a student may be represented by the following chart:


Student for Training
Teaching activity and proficiency controls
Success
Failure
Continuation
Transfer
Drop-out
Drop-out
Transfer
Repeat
Degree
Subsequent studies in the same cycle, etc.

A repeater can in no case be considered as a final output and the cost of repeating has to be apportioned among the other outputs of teaching activity:

- success
- drop-out or transfer (it is difficult not to consider students dropping out or changing universities in the course of their studies as final outputs).

If we generalise the problem to any group of U.E.A.E.s which have to be obtained before a degree can be awarded we have two final outputs:

- students who obtain their degree,
- students who leave the university,

and we apportion the repeaters between these two categories.

N.B. Special cases:

(1) Students registered for two degrees at the same time:

These cases can only be detected in the same university. If there is no common U.E.A.E. the problem presents no difficulty, the outputs being produced as if there were two separate students. If certain U.E.A.E.s are common to both degrees, it would seem logical to regard one of the degrees as the main one, bearing all the U.E.A.E. costs necessary to obtain it, while the other is accessory and bears only the costs of the U.E.A.E.s which are specific to it.

(2) Training without proficiency controls:

Certain types of permanent training do not involve any proficiency controls. Apart from the students who rapidly and openly drop out, can it be concluded that there are no failures in this kind of training?

(3) Credit structure and year structure:

Some degrees have a credit structure i.e., success in one credit is independent of the results obtained in others. The system outlined in the present study is based on this structure. But other degrees have a year structure i.e., the result depends on an examination in all subjects studied over a single year. Chapters 9 and 10 are concerned with the methods proposed for dealing with these two different cases.

8.1.3 Recording of information

The basic information is therefore, the number of successes, repeats, drop-outs or transfers at the end of each year in respect of each U.E.A.E. This information may be recorded as a time-series i.e. a reconstitution of average university careers or as a cross-section i.e., the calculation of percentages at different levels during the same year. This will be dealt with in Chapter 9.

Whatever the method adopted, it is necessary to maintain an individual file of students and a file of registrations and results per U.E.A.E. The need to make these files an integral part of the student records maintenance system needs no emphasizing (see for example the description of the SYGESCO System: note by M. Portal, Grenoble, April 1973).

8.2 Research Outputs

Research outputs may be defined as "the creation of new knowledge, the reorganisation of knowledge and the application of knowledge"(1).

This output may take the form of discoveries, publications, patents or licences etc.

---

(1) Wiche, Programme classification structure NCHEMS (p. 35).

In fundamental research, which is the special province of the universities, it is generally considered that the quantification of research results is particularly difficult at the present time. At its present stage, it is possible that the work of the Group can be limited to the calculation of the global costs of activity per U.E.A.R., whatever the output may be.

8.3 Services to the public

A university's public service activity is generally considerable but rarely specific. Although it is possible to enumerate the services rendered to the community or its individual members, there are two obstacles to the calculation of the cost of these services:

(1) Certain services are obtained as by-products of an activity which is geared to a principal objective (e.g. the circulation of information to non-students, when they attend courses organised for students).

(2) Certain services are too diffuse to be perceptible (e.g., general information and cultural influence).

We therefore propose that calculations should be restricted to public services arising from a specific activity and that the costs of those which are obtained as non-recordable by-products should be estimated as nil. A non-exhaustive list of the services considered with reference to this type of criterion might be as follows:

(1) Public educational services:

- Circulation of knowledge to non-students (lectures, courses organised for non-students, commercialised educational publications etc...);
- Libraries open to non-students, in as much as a disfunction between the two categories of users is possible;
- University radio or television programmes;
- Etc....

(2) Services to the community:

- Scientific consultative work in the context of the university's activity (excluding private consultative work undertaken by teachers or researchers);
- Medical services provided by a university hospital.

(3) Services to former students:

- Placement services;
- Association of former students;
- Etc....

8.4 Accessory outputs:

This category covers the portion of normally intermediate outputs which are transferred or sold outside the university.

This portion is generally known and measured and its cost is calculated without difficulty as the unit costs of the U.E.A.P.s are related to the quantities of services used.

An exhaustive enumeration is not normally possible but we may quote the following examples:

- sale of computer time
- hiring out of classrooms or amphitheatres
- hiring out of university sports installations
- etc....

It will be clear from this rapid description of a university's output that Chapters 9 and 10 will deal only with the methods of calculating the unit costs of teaching output.

Diagram of the various type of output:

Teaching Output	Research Output	Public Service	Accessory Output
- intermediate		- education	
		- services to the community	
- Final		- services to former students	

CHAPTER 9

STUDENT FLOWS

The transition from unit activity costs to unit output costs necessitates information on the student flow obtained by two different approaches:

- cross-section approach, showing the breakdown of the student flow in any particular year among the U.E.R.s and the various university courses or credits;
- time-senses approach, showing the flow of students from one year to another leading either to a degree or to a decision to drop our or leave.

As regards the term student, there is frequently a choice between four different possibilities. Students may be seen as:

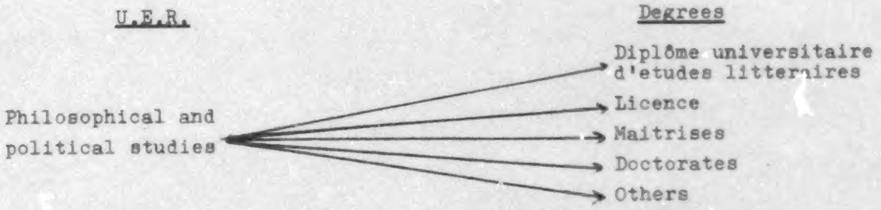
- registered by the administrative services
- registered for teaching purposes
- registered for examination either at specific level of studies or in a specific subject
- present at an examination

In certain universities two types of registration may overlap (e.g. students registered for teaching purposes and students registered for an examination). To ensure consistency with the rules used in calculating activity costs it is suggested that the first type of registration should be used here, providing a complete breakdown of the U.E.A.E.s chosen.

9.1 Breakdown of students in year t among the various U.E.R.s or credits

From the output standpoint, a university may primarily be defined by the degrees it awards. Although these degrees are statutorily awarded by the President of the University it is the U.E.R.s or perhaps their departments which are responsible (by compiling marks and setting up examining boards). Although a U.E.R. is of course responsible for several degrees in most cases, a degree generally depends administratively on a single U.E.R. and sometimes a single-department (injective mapping of U.E.R.s and degrees)

Example:


U.E.R.
Degrees
Diplôme universitaire d'etudes litteraires
Licence
Philosophical and political studies
Maitrises
Doctorates
Others

Although the courses or credits are attached to a U.E.R. or department for teaching purposes, many of them may be on the curriculum for several different degrees.

There is consequently no exclusive connection between a course (or a credit) and a degree.

The breakdown of the students registered at the university in a given year is of course very simple, when at one and the same time:

H1 - the degree concerned has a year structure (for example transition to the second year after overall success in the first year)

H2 - all degree courses and credits are provided by the same U.E.R. or the same department.

In this case the students' options remain within the U.E.R. and the students can be kept under review by reference to degree year they have reached:

Example: U.E.R. W

450 third-year students for a degree X involving two optional subject Y and Z
4 common-core credits
8 credits distributed over two optional subjects

U.V. X 3 - 1	450	U.V. X 3 - 5	200
U.V. X 3 - 2	450	U.V. X 3 - 6	200
U.V. X 3 - 3	450	U.V. X 3 - 7	200
U.V. X 3 - 4	450	U.V. X 3 - 8	200
		U.V. X 3 - 9	250
		U.V. X 3 - 10	250
		U.V. X 3 - 11	250
		U.V. X 3 - 12	250

In this case, knowing the average cost per student in a given credit (chapter 7), an output cost such as the unit cost per third-year student working for a degree X can easily be obtained by simple addition.

If hypothesis H2 is dropped the problem becomes complicated because the students' "choices" (often unavoidable) will have to be traced throughout the university.

If hypothesis H1 is dropped the problem becomes complicated because the number of credits chosen by the students is comparatively unrestricted and the number of actual students working for a given degree is different from the number of full-time equivalent students

9.1.1 Breakdown of students by U.E.R.s and credits and calculation of global costs

The preliminary student breakdown may be made from their actual presence in any given U.E.R. For example, for first-cycle students at a university with four U.E.R.s the following two-dimensional table can be compiled.

Table 1:

Students' host U.E.R.s

		1	2	3	4
Students' base U.E.R.s	1	a_{11}	a_{12}	a_{13}	a_{14}
	2	a_{21}	a_{22}	a_{23}	a_{24}
	3	a_{31}	a_{32}	a_{33}	a_{34}
	4	a_{41}	a_{42}	a_{43}	a_{44}

The a_{ij} $(i \neq j)$ represent the number of students in their base U.E.R. i who have taken at least one credit in a host U.E.R. j. The a_{ij} $(i = j)$ represent the total number of students attached to U.E.R. j. This of course gives us $\sum_{j} a_{ij} = N$, the total number of students actually enrolled at the University.

For every i, $a_{ii} > a_{ij}$. In hypothesis H2, only the main diagonal has a number of students which is not nil ($a_{ij} = 0$ when $i \neq j$). This matrix, however useful it is, obviously does not supply the information necessary to enable unit activity costs to be used. An additional dimension must be brought into play, i.e., the credits chosen in each U.E.R.

a_j^k represents the number of first-cycle students who have chosen credit no. k of U.E.R. j in the course of year t. This number of students can be broken down according to the students' home U.E.R.s. In the case of credit k of U.E.R. j we then get:

$$a_{1j}^k + a_{2j}^k + a_{3j}^k + a_{4j}^k = \sum_i a_{ij}^k = a_j^k$$

For U.E.R. 2 with m credits which can be chosen by first-cycle students, we would then have:

Table 2:

U.V:	1	2	k	m
U.E.R.				
1	a_{12}^1	a_{12}^2	a_{12}^k	a_{12}^m
2	a_{22}^1	a_{22}^2	a_{22}^k	a_{22}^m
3	a_{32}^1	a_{32}^2	a_{32}^k	a_{32}^m
4	a_{42}^1	a_{42}^2	a_{42}^k	a_{42}^m
Total	a_2^1	a_2^2	a_2^k	a_2^m

Line 2 represents the number of students in U.E.R. 2 who have chosen the credits of this U.E.R. Lines 1, 2, 3 and 4 represent students from other U.E.R.s who have chosen the credits U.E.R. 2.

A vertical addition gives the total number of students for credit k in U.E.R. 2. A horizontal addition would show the number of students per credit coming from U.E.R. i (i = 1, 2, 3, 4). But this figure presents no interest as the credits are very heterogeneous in "weight" and content.

Related to its place in the overall picture, this third dimension gives the following breakdown:

Table 3:

Host U.E.R.s

		U.E.R. 1 credit	U.E.R. 2 credit	U.E.R. 3 credit	U.E.R. 4 credit
		1...........p	1.......k...m	1...........9	1...........r
Base U.E.R.s	1		$a_{12}^1 \ldots a_{12}^k \; a_{12}^m$		
	2	$a_{21}^1 \ldots\ldots a_{21}^p$	$a_{22}^1 \ldots a_{22}^k \; a_{22}^m$	$a_{23}^1 \ldots\ldots a_{23}^q$	$a_{24}^1 \ldots\ldots a_{24}^r$
	3		$a_{32}^1 \ldots a_{32}^k \; a_{32}^m$		
	4		$a_{42}^1 \ldots a_{42}^k \; a_{42}^m$		
Total		$a_1^1 \ldots\ldots a_1^p$	$a_2^1 \ldots a_2^k \ldots a_2^m$	$a_3^1 \ldots\ldots a_3^q$	$a_4^1 \ldots\ldots a_4^r$

In theory all the boxes in this table which is on a very big scale (several hundred columns) may be "non-empty". In practice there is no doubt that many of the boxes which are not along the main diagonal will be empty. In each of the credits the students could no doubt have been broken down not only by origin but also by the type of proficiency control (continuous or periodical) which they chose. Does the cost per student differ according to the type of control he chooses? As this distinction was not made in connection with unit activity costs (chapter 7) we shall not make it here unless the Group recommends otherwise. Two points should be clarified in connection with the above table:

1) In compiling the tables it has been at least implicitely assumed up to now that each U.E.R. is responsible for a single degree. Let us take the example of a history degree, or "DUEL d'histoire", whose first cycle we shall consider here. In many cases the U.E.R.s are responsible for several degrees, starting from the first cycle e.g. history and history of art, in the case of U.E.R. 2 covering history, archeology and history of art. We must therefore come down from the level of the U.E.R. to the level of the degree. For example for credit k of U.E.R. 2 the following distinction will have to be made:

${}_1a^k_{32}$, the number of first-cycle students taking the curriculum for degree number 1 of U.E.R. 3 and taking k credits of U.E.R. 2:

${}_2a^k_{32}$, number of first-cycle students taking the curriculum for degree number 2 of U.E.R. 3 and taking credit k of U.E.R. 2 where ${}_1a^k_{32} + {}_2a^k_{32} = a^k_{32}$.

2) It may be wondered what credits should be considered in a table of first-cycle students. The answer obviously is that all credits should be considered which they are likely to be taken either by first cycle units of the U.E.R. to which the credits belong or by first cycle students at other U.E.R.s. In certain universities it has emerged that although there is no doubt about the cycle to which certain credits must be attached (first cycle, second cycle) there is less certainty about other credits which may well be chosen by students from different cycles.

To sum up, the choices of university students can be analysed if there is a system of open U.E.R.s which have no fewer than 5 dimensions:

- host U.E.R.s: e.g. modern arts
- credits at host U.E.R.s: e.g. from 1 to m
- U.E.R.s base (optional): e.g. foreign languages, literatures and civilisations
- curricula offered by base U.E.R.s: e.g. German, English, Spanish, Italian, etc.
- level in the course: e.g. Diplôme universitaire d'études littéraires (D.U.E.L.)
  Licence
  Maîtrise
  Doctorate
  Other courses

This analysis enables us to reply to questions of the type: what is the unit cost in year t of DUEL students of U.E.R. 2 assuming, for example, that this U.E.R. deals with a single degree course (e.g. philosophy)? The overall cost of the students is quite easy to calculate in view of the unit activity costs already calculated.

Let c^k_j be the unit cost per student of credit k of U.E.R. j. The DUEL students of U.E.R. 2 account for a total cost of:

- in U.E.R. 1 $a^1_{21}c^1_1 + \ldots\ldots\ldots\ldots\ldots a^p_{21}c^p_1$

- in U.E.R. 2 $a^1_{22}c^1_2 + \ldots\ldots\ldots\ldots a^m_{22}c^m_2$
- in U.E.R. 3 $a^1_{23}c^1_3 + \ldots\ldots\ldots\ldots a^q_{23}c^q_3$
- in U.E.R. 4 $a^1_{24}c^1_4 + \ldots\ldots\ldots\ldots a^r_{24}c^r_4$

Total = C_2

It may, of course, only be necessary to add up the direct costs or the semi-direct costs, or the total costs, according to requirements. The transition to unit costs is more difficult.

9.1.2 Calculation of the unit costs of outputs awaiting allocation

The term "output awaiting allocation" refers to students who are registered in year t for a year or a credit (whatever the result of the control) and have not yet taken a decision regarding year t plus 1.

In a system of study in which students register for a year before registering for their courses and credits, the transition to unit costs is not theoretically difficult. For example, let us assume that the DUEL in question involves registrations on a yearly basis. Let N be the overall number of students in the two DUEL years at U.E.R. 2. The unit cost of a DUEL student at U.E.R. 2 is quite simply C_2/N.

But, even in this case certain students enjoy the advantages of a long course which enables them to do one year's degree work in two years. In these circumstances they cannot be shown as full-time students and when the number of students is being totalled, they might, for example, be given a weighting of ½.

Cases where there is no year structure (dropping hypothesis H1) are more difficult. For example to obtain a particular degree 24 credits are necessary but in an extreme case a student could obtain his degree in 24 years taking only 1 credit per year. It is obvious in this case that if the total cost were divided by the number of students enrolled at the university the real unit cost would be underestimated. These part-time students must therefore by converted into full-time equivalents. The task would be easy if all credits could be considered to have approximately the same "weight". The number of students per credit at a certain level in a particular course (for example the philosophy DUEL) would be calculated by merely adding up the number of these students in the various credits they have taken (horizontal addition in table 3) after which the number of students per credit would be divided by the number of credits which it is considered normal to take in the course of a year (for example 8).

As the credits are actually very heterogeneous they must first be standardized. A credit representing a semester course of three hours per week without any supervised work sessions would be given a coefficient of 1 while the same course with supervised work sessions of 1½ hours per week would receive a coefficient of 1.5 and a year's course of 3 hours a week without supervised work sessions a coefficient of 2 etc...... The number of students per standardized credit would then be calculated. The last step would be to determine the divisor in order to find the number of equivalent full-time students. Here again an analysis of the "normal" choices of students is essential. If it is considered that 3 of the 8 non-standardized credits are annual and that 2 entail supervised work sessions while 5 are semester credits two of which also entail supervised sessions the divisor will finally be:

$(2.3 + 1.2) + (2.1.5 + 3.1) = 14$

Only a detailed analysis of all the courses at a university would enable adequate weighting coefficients to be calculated. These methods therefore make it possible to calculate certain costs in respect of outputs registered in the course of a given year. But other output costs necessitate an analysis of student flows year by year until they are awarded their various degrees or leave the university.

9.2 Analysis of student flows over time

This method is based on the observation of an intake of students from the time they enter the university system (or a cycle of studies) until they leave the system (or obtain a degree at the end of the cycle of studies).

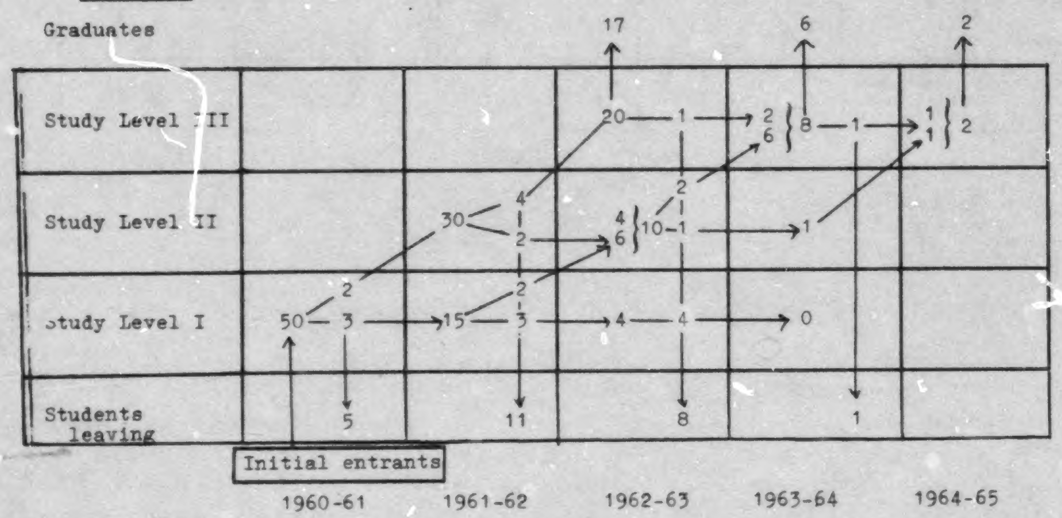
As far as the method is concerned, a distinction must be made between two cases i.e. courses which are organised with intermediate levels of study and courses which are not. In both cases three factors will have to be taken into account:

- cost variations during the period of observation;
- students who repeat the course;
- students leaving and arriving during the period of study.

9.2.1 Case in which the course is organised with intermediate levels of study(1)

The unit in which a teaching course is organised in this form may be represented by a chart in which the years under review are shown vertically and the levels of study horizontally. For example, we may consider a university which has organised its course for a certain degree in three levels of study and is observed over a five-year period. The chart will show the successive situations encountered by 50 students registered for the first time.

Flow of 50 students registered for the first time at the beginning of university year 1960



Key to arrows

2 Departure or cessation of studies by two students after success

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1) For a simulation of this case in terms of the Markov process please consult "Application des chaines de Markov aux chances de succès des étudiants" par A. BABEAU et C. BOCQUET, Annales de l'Université de Lille, Faculté de Droit et de Sciences Economiques, 1970.

—1→↓ Departure or cessation of studies by one student after failing the examination at the particular level of studies

↗ Transition to the next higher level (success)

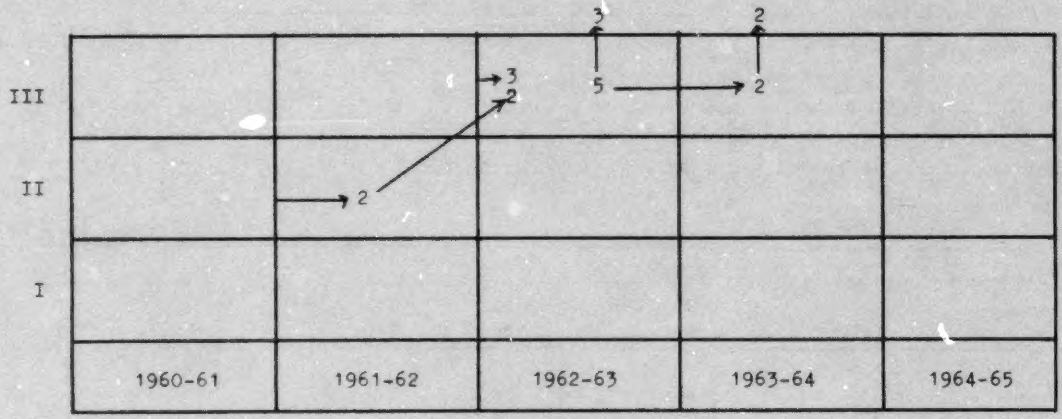
→ Repeat

↑ Success at the final examination (on which the degree is awarded)

For example, out of the 50 students registered for the examination at the first level of studies 32 will pass and 30 of these will register for the second level in the same institution while 2 will leave. On the other hand 18 will fail and of these 15 will repeat the year in the same institution. Three will leave.

We will call the group of 50 students the "1960-61 intake".

The chart also shows students who arrive in the course of the year. The diagram below records the arrival of two students who were directly registered in the second level of studies in 1961-62 and 3 students directly registered in the third level of studies in 1962-63.



It will at once be seen that although this method gives a clear picture of the student flow it has two drawbacks:

- the cost of a graduate from this intake cannot be worked out until all the students have moved on out of our chart and this calls for observation over a considerable number of years;
- the costs of a graduate cannot be worked out for a specific date.

The curriculum at a given level of studies can be organised either in the form of compulsory and optional subjects or in the form of credits. In any event the U.E.A.E.s are clearly identified.

If the cost per student is not required with absolute accuracy it will be sufficient to show the total cost of the courses organised at the given level and the number of students registered at that level. This procedure will be justified when there are no optional subjects at the level of studies concerned.

But if a much more accurate picture of the costs is required it will be necessary to pin-point the courses taken by each student at each level of studies. This method of costing will be more or less compulsory in cases in which a wide range of options are taught at a particular level of studies.

9.2.2 Courses organised without intermediate levels of study

A student will be awarded his degree when he has obtained a certain number of credits. Certain credits are sometimes compulsory for the award of certain degrees but there is no systematic order of priority in the credits to be chosen.

In this case the credits which are chosen by each student in the intake under review must be noted. The cost per graduate is calculated by adding up the costs of the credits chosen. Repeaters and drop-outs may also be costed. It is more difficult for costs in respect of students arriving in mid-career to be allocated to one or other intake.

The total cost per intake can be determined in this way provided that all the elements of the intake have completed their cycle of studies (or until it has been promoted to a higher cycle if the costing procedure is concerned with a degree awarded at the end of a cycle of studies).

In any event the statistical analysis will be much longer in this case than if a course is organised with very specific levels of study.

CHAPTER 10

INTRODUCTORY REMARKS ON THE COSTING OF EDUCATIONAL OUTPUTS(1)

Chapters 8 and 9 have focussed on a number of difficulties encountered in assessing the quality and quantity of educational outputs and have proposed a number of options.

The options may be summarised as follows:

1. For each level and type of education there are only two categories of final outputs:

- graduates
- drop-outs and transfers
- a category of intermediate outputs:
  students in course of studies.

2. There are two approaches to aggregation:

- cross-section approach: cost of the output in a given year
- time-series approach: cost of the output which it has taken several years to produce, production conditions not being necessarily the same each year.

The major difficulty is that each student follows a course of studies which is specific to himself not only with regard to the optional subjects he chooses but also the rate at which he passes his examinations.

Two calculating procedures may be adopted:

1. Costing by individuals and calculation of averages;

2. Direct calculation of average costs.

10.1 Individual costs and averages

Undoubtedly this method is conceptually the simplest and most accurate but it calls for a particularly voluminous data processing equipment.

It is based on the principle of combining the results of a calculation of unit costs of teaching activity (as previously described, for example) and the costs of a student records management system (SYGESCO, see notes on M. PORTAL, Grenoble, 1973). In this way each student is allocated the costs which relate to him in particular and costs are aggregated by a simple calculation of the averages per category.

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(1) For a preliminary approach to educational costing reference may be made to Page (André), l'Economie de l'Education (Economics of Education), PUF, Paris 1971, p. 173-196.

10.1.1 Individual costs

The information required is a student file showing each student's course in detail, registrations in U.E.A.E.s and passes and failures each year. A time-series approach has to be adopted. All that is then required is to allocate the costs of the U.E.A.E.s in which each student has been registered (these costs may either be total or partial, retrospective or prospective, according to the requirements of the calculation) and to add the costs directly allocated to students in each university year (see chapter 5). The costs in respect of each individual student at whatever stage of his studies (intermediate or final) and in the light of his own options, choices and results can then be calculated by simple addition.

The method of calculation is of course the same whether we are considering a degree with a year structure or a degree with a credit structure.

Example of an individual file

Name: DUPONT
First name: Alain
Born: 25th June, 1951
Ref. No.: 1.51.06.75.101.001

Date of registration: 15th September, 1970
Degree: 1st-cycle economic sciences

Year: 1970-71 1st year		Year: 1971-72 1st year (repeat)		Year: 1971-73 2nd year	
Compulsory credits		Compulsory credits		Compulsory credits	
Economic analysis (3)	1660.0		1830.0	Economic analysis (2)	1300.0
National accounting (1)	580.0	d°	600.0	Money and credit (1)	540.0
Statistical Mathematics (2)	1400.0		1510.0	Statistical Mathematics (2)	1400.0
				Business Accounting (1)	560.0
Optional credits		Optional credits		Optional credits	
Economic history	380.0	Economic history	400.0	Commercial law	440.0
Political science	410.0	Sociology	420.0	Public law	420.0
International relations	360.0	International relations	350.0	Public finance	360.0
General principles of economic law	700.0	Demographic geography	380.0	Computer science	360.0
Direct costs	700.0	Direct costs	680.0	Direct costs	710.0
Total for the year	5910.0	Total for the year	6170.0	Total for the year	6090.0

Degree awarded: June 1973

Cost of degree: 18,170 francs

N.B.: A complete file would mention the result: pass (P) or failure (F) per credit and per year.

10.1.2 General calculation

The average output costs must be calculated by both the cross-section and time-series methods.

1. Cross-section method

The purpose of this calculation is largely to verify that the overall cost of teaching activity in a given university year plus the costs directly assigned to students is equal to the costs absorbed by the educational outputs (final or intermediate). This means that in a given university year the cost of educational activity is fully apportioned among:

final outputs:
- students awarded their degree at the end of the year
- students dropping out at the end of the year
- students deciding to change universities in the following year

intermediate outputs:
- students in course of study remaining in the same university the following year.

The last three categories are in the nature of outputs awaiting allocation pending a decision with regard to the following year.

The average per student/year is a concept which has a certain significance in the case of degrees with a year structure, providing the decision to drop out or repeat in case of failure is taken into account. The concept can also be used to deduce, by addition, the cross-section cost of the amount of output representing a degree, a drop-out at a particular level or a student in course of study, provided that the average repeat rate for the year is taken into account.

In the case of degrees with a credit structure, the nature of the calculations depends on the flexibility and diversification of the system. In normal cases, i.e. where credit costs are not comparable, it is possible to compile average cross-section costs of complete degrees (final outputs) or partial degrees (intermediate outputs) allowing for all possible diversifications.

2. Time-series method

This method calculates the cost of the final outputs in a given year, excluding outputs in course of production in that year (i.e. students in intermediate years or students who have announced their intention of repeating the final year in case of failure).

It is possible to calculate the following average costs for a given degree awarded in a given year, whatever the year of the initial registration:

- average cost of a graduate
- average cost of a student leaving in the course of his training: the various levels of partial training can be shown in sub-categories
- average cost of a student in training at a given level.

N.B.: With the time-series approach it would seem essential to work in constant units of currency.

10.2 Direct calculation of average costs

As all universities do not necessarily possess individual student files they cannot employ the method we have outlined above. It is therefore important to consider whether a more global method can be envisaged.

Chapter 9 showed that the flow analysis differed according to whether a time series or a cross-section approach was adopted and the method must be expected to be somewhat different in each case.

10.2.1 Cross-section method

The method of calculating the output awaiting allocation described in paragraph 9.1.2 cannot be automatically applied to final or intermediate outputs (after a decision regarding the ensuing year), because aggregation by the cross-section method has to take account of repeaters.

However, although there is no known statistical study on this problem it would seem necessary to envisage the existence of two different repeat rates for a given level of studies, i.e., year or credit. The first is the rate for students who finally graduate and the second the rate for students who eventually drop out before the end of their course. The number of degrees which have to be obtained within a given time limit (e.g. 3 years in the case of first-cycle degrees in law or economics) make this fact unmistakable. But it would be unrealistic to differentiate between these two repeat rates except by reference to individual students and this calls for the maintenance of a student file and brings us back to the previous case.

However, let us assume that it is possible to ascertain these two rates by a global method.

1. Degrees with a year structure

n : number of years' study for the degree

$\overline{\qquad}$

$(i \in \{1, \ldots, n\})$

N_i : number of students registered in year i;

N_i is split into two sub-groups: N'_i for students who will finally graduate
N''_i for students who will drop out;

$\alpha i_1 = \frac{R'_i}{N'_i}$: average repeat rate in year i for students graduating;

(average number of repeaters in year i who will finally graduate divided by the number of graduates);

$\alpha i_2 = \frac{R''_i}{N''_i}$: repeat rate in year i for students who will drop out;

(average number of repeaters in year i who will drop out divided by the number of drop-outs);

K_i : sum of the costs of the UEAEs in year i;

γ : average annual unit cost directly allocated per student.

The average unit output costs may now be estimated:

- cost per graduate:

$$\left[\sum_{i=1}^{n} \frac{K_i}{N_i} (1 + \alpha i_1) \right] + \sum_{i=1}^{n} (1 + gi_1)\gamma$$

- cost per student abandoning his studies after success in year (i) and leaving at the end of the (i + 1)th, whatever the result of the (i +1)th year is:

$$\left[\sum_{j=1}^{i+1} \frac{K_j}{N_j} (1 + \alpha j_2)\right] + \sum_{j=1}^{i+1} (1 + \alpha j_2)\gamma$$

2. Degrees with a credit structure

m : number of credits required for the degree ($k \in (1....m)$)

M_k : number of students registered for credit k

αk_i : average repeat rate for credit k in the case of students graduating

αk_2 : average repeat rate for credit k in the case of students who drop out

C_k : global cost of credit k

γ : average unit cost directly assigned per student

F : average number of credits taken per year

- cost per graduate:

$$\left[\sum_{k=1}^{m} \frac{C_k}{M_k} (1 + \alpha k_1)\right] + \sum_{k=1}^{m} (1 + \alpha k_1) \frac{\gamma}{F}$$

- cost per student dropping out after successfully passing credit p:

$$\left[\sum \frac{C_k}{M_k} (\quad + \alpha k_2)\right] + \sum (1 + \alpha k_2) \frac{\gamma}{F}$$

γ is added to this cost if the student has obtained no credit in the last year.

N.B.: The sign Σ is not indexed as credits may be chosen in any order apart from a few exceptions, and it is therefore not possible to indicate any order of precedence as between p and m.

It is obvious that in a credit structure the cost of drop-outs cannot be accurately determined unless it is possible either to treat the credits collectively (see chapter 9) or personalise them completely. This deficiency is emphasized by the looseness of the pseudo-mathematical notations used.

10.2.2 - Time-series method

The investigation of the student intakes described in 9.2. makes it possible to envisage a system for calculating output costs over a period of time. The student flow chart will undoubtedly enable the method outlined in 10.1 to be applied without a personal student file provided only that the global costs of the UEAEs are known.

Owing to the difficulty of using the intake method for degrees with a credit structure we propose to confine ourselves to degrees with a year structure in the present study.

Two approaches to the costing of finished outputs may be adopted:

- costing the finished outputs for a given year, irrespective of the initial year;

- costing a given intake irrespective of the final year.

It is obvious that the average figures will be identical in both cases over a long period even if the annual results are different.

In both cases it will suffice to consider the overall flow chart in which the peaks are evaluated with reference to the cost per student of all the UEAEs representing one year. In the first case we shall consider all flows arriving at the same final point (irrespective of whether they are passes, drop-outs or departures) and in the second case, all flows starting from a common initial point.

A numerical example will help to clarify the method. The diagram in paragraph 9.2.1. will be used as a basis although it is incomplete as regards the costs at the final point as it deals with a common initial point.

Let us now combine it with a matrix of costs per student per year of study (including the costs directly assigned to students).

Year / Level	1960 1961	1961 1962	1962 1963	1963 1964	1964 1965
III	-	-	6 000	6 500	7 000
II	-	5 000	5 500	6 000	-
I	4 000	4 200	4 300	-	-

1. - Costs with reference to final point: (example: cost of graduates in year 1963-64) (see chart page 112)(1)

The average cost of a graduate in 196[illegible] is therefore:

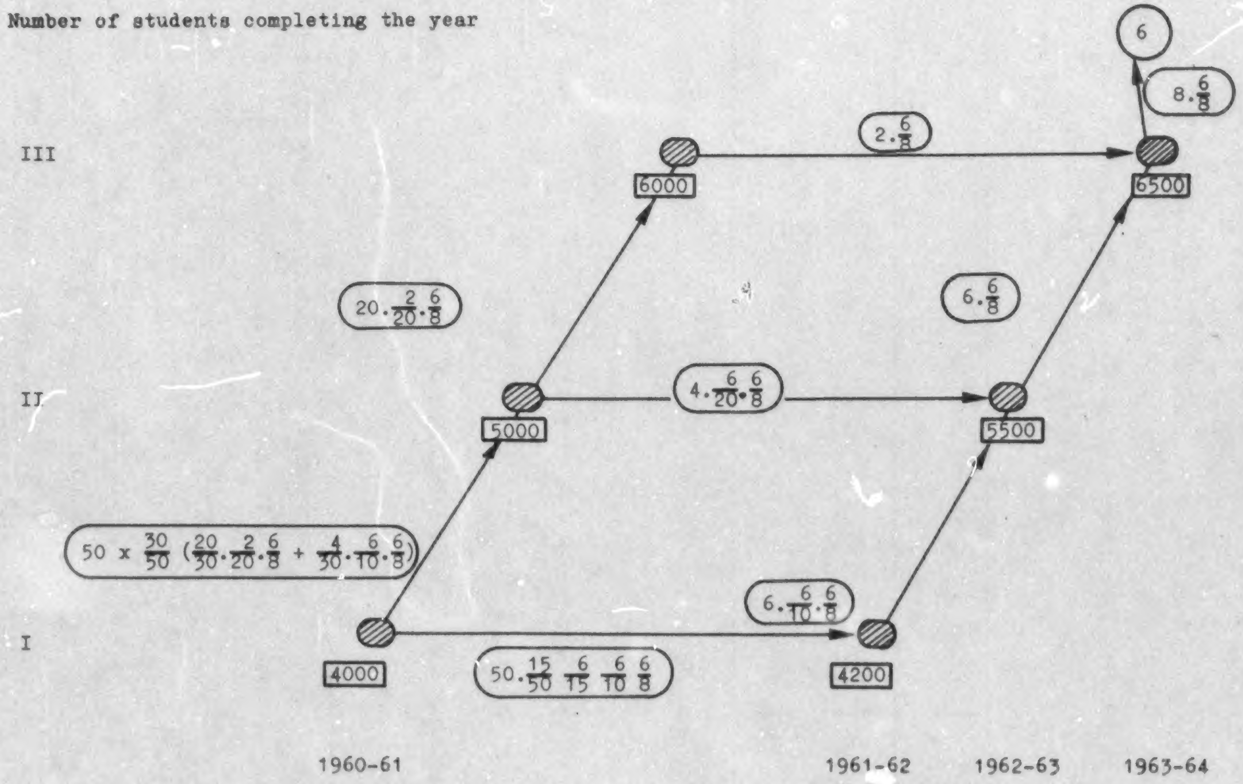
$$C = \frac{1}{6} . 4\,000 . 50 . \frac{6}{50} + 4\,200 . 6 . \frac{5}{10} + 5\,000 \left(20 . \frac{2}{20} . \frac{6}{8} + 4 . \frac{6}{10} . \frac{6}{8}\right)$$

$$+ 5\,500 . 6 . \frac{6}{8} + 6\,000 . 2 . \frac{6}{8} + 6\,500 . 8 . \frac{6}{8} = 20\,765$$

2. - Costs with reference to common initial points: a distinction must be made between the various final points:

---

(1) Method of calculation: Each arrow concerns a number of students starting from a common initial point in the flow chart (9.2). The number of students at the final point of the same arrow can be obtained by mathematical expectation. For example, if there are six students out of the original eight at the final point the mathematical expectation is $8. \frac{6}{8}$. Similarly, the transition from the second to the third year in 1962 shows two students out of the 20 in the second year, i.e. an expectation of $20. \frac{2}{20}$. In the light of subsequent developments the overall expectation is $20. \frac{2}{20} . \frac{6}{8}$. It will be seen that at any given moment the vertical sum of the arrows is always 6.


Number of students completing the year
III
II
I
6
8.6/8
2.6/8
6000
6500
20.2/20.6/8
6.6/8
4.6/20.6/8
5000
5500
50 x 30/50 (20/30.2/20.6/8 + 4/30.6/10.6/8)
6.6/10.6/8
4000
4200
50.15/50 6/15 6/10 6/8
1960-61
1961-62
1962-63
1963-64

Flow chart and cost of 6 graduates in 1963-64

Results at Final Point			Number	Unit Cost	Average cost per Category
graduates		1962-63	17	15 000	17 375
		1963-64	6	20 765	
		1964-65	2	27 392,50	
Dropouts	I -	1960-61	3	4 000	8 660
		1961-62	3	8 200	
		1962-63	4	12 500	
	I +	1960-61	2	4 000	6 100
		1961-62	2	8 200	
	II -	1961-62	2	9 000	10 673,33
		1962-63	1	14 020	
	II +	1961-62	4	9 000	10 673,33
		1962-63	2	14 020	
	III -	1962-63	1	15 000	17 882,50
		1963-64	1	20 765	

It will be seen that the total cost of the intake, i.e. 677,200 francs, is indeed the sum of the average costs of the various outputs.

The matrix of average aggregate costs is:

		15 000	20 765	27 392.50
	9 000	14 020	20 020	
4 000	8 200	12 500		

The costs in each box are obtained by weighted averages of previous costs and costs for the present year.

Example: costs for the second year in a three-year period:

$$9\ 000 \cdot \frac{4}{10} + 8\ 200 \cdot \frac{6}{10} + 5\ 500 = 14\ 020$$

It is obvious that this latter method also makes it easy to calculate the cost of an intermediate output at a given level obtained over a given period. In the previous example a student who has taken four years to get to the end of the second year of a 3-year course costs 20,020 francs.

10.3 Conclusion

This rough analysis shows that although the individual method (10.1) is very cumbersome owing to its information system, global methods require very complex calculations to produce results whose accuracy often leaves much to be desired.

PART FOUR

AN APPROACH TO BUDGET CONTROL

CHAPTER 11

EX-ANTE ACTIVITY COSTS

The twofold objective: budget control
decision making
implies the calculation of three types of costs per UEAE:

1. Retrospective costs representing the costs of an actual situation considered at its most elementary level. They will reflect all types of cost incidence whether normal or abnormal (see chapters 6 and 7).

2. Smoothed costs which are intended to reflect an average or budget situation. The present structure is maintained and the costs are absorbed in their conventional-structure by the UEAs in the form of averages designed to even out any anomalies. It now has to be decided what field to adopt for the calculation of the averages. Two approaches are possible:

   - to adopt the whole university, in which case the smoothing process will eliminate a considerable number of divergencies which may be considered normal from a short-term standpoint (different levels of remuneration among the teaching staff classified by subject or discipline);
   - to adopt a more restricted field, i.e. the UER or even the department, in which case the divergencies revealed by the retrospective costs are far fewer.

   This type of cost should logically be an ex-ante cost and consequently be calculated from the budget data, but it may be wondered whether this approach is possible as the budget breakdown is not very detailed and whether it is even desirable in view of the way in which the blanket appropriations in the budget are decided.

3. Normative costs which arise from the need to revise methods and structures to determine optimum productive combinations or types of combination which are more effective than those now used. The calculation of these costs is based on a comparison of possible output systems in the light of the type of output desired and a standard pricing system. This third type of costs calls for research into the output quality and the elasticity of input substitution and it is obvious why this third approach is not considered here.

The comparison between the first two types of costs is the basis of budget control in the strict sense of the word. An analysis of the various forms of the third type would make it possible to decide the combinations to be adopted and the structural constraints which might be revised.

11.1 Calculation and use of "smoothed" costs

This type of ex-ante costs is therefore designed to eliminate the anomalies which actually arise while maintaining the present structure as far as possible.

The accounting context will therefore be exactly as for the retrospective costs but in the assignment of the direct costs and the apportionment of the semi-direct costs, correctives will appear to ensure the desired "smoothing" procedure by:

- replacing the actual conventional charges by budget charges whenever the university budget appears as an accurate and impartial forecast;
- smoothing aberrations arising from abnormal situations, spoilage or shortages observed at the level of a particular UEA.

It is difficult to give any ready-made rules for the level of smoothing of each conventional charge as everything depends on the particular situation prevailing in each university at a given time and the use to be made of these costs.

As a rough guide the following system may be suggested for UEAEs in the context of an inter-UER comparison in the same university or between universities which are of the same size and work on the same lines:

- lecturing staff: smoothing by departments (and by cycles if the subjects are taught by senior staff) of the global remuneration, the average number of semesters of teaching, the proportion of time spent on research (if this has not already been done at the level of the retrospective costs) or on administration;
- staff in charge of supervised work sessions: average per department between assistants and staff in charge of supervised work on the basis of the number of supervised work groups defined by application of the norm specific to the UER or the university;
- premises: real costs per square metre applied to premises assumed to be adequate in number and size;
- services: real cost or rational absorption cost (cost of full utilisation) applied to a quantity of services, excluding errors and spoilage.

11.2 Numerical example relating to teaching staff (as set forth in chapter 6, 6.1.1.1)

11.2.1 Data

A department includes four lecturers for which the following information is available:

	Lecturer A	Lecturer B	Lecturer C	Lecturer D
Teaching service(1)				
- normal	2	2	2	2
- additional	0	3	0	2
Remuneration(2)				
- salary				
+ research allowance	47,000	47,000	82,000	82,000
- additional courses		12,000		8,000
- research agreements	10,000	-	12,000	
TOTAL	57,000	59,000	94,000	90,000

Overall breakdown of working time (based for example on an indirect time budget survey):

- teaching: 70%
- research: 25%
- administration: 5%

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(1) In semester equivalents without supervised work sessions (one semester with supervised work being, for example, equivalent to two semesters without supervised work).

(2) Annual remuneration including all salary charges and taxes paid by the employer.

11.2.2 Individual calculation, equating additional teaching service with courses by outside teachers

	Lecturer A	Lecturer B	Lecturer C	Lecturer D	Smoothed
Semester of normal teaching	16,450	16,450	28,700	28,700	15,431
Semester of additional teaching		4,000	-	4,000	
Research	21,750	11,750	32,500	20,500	21,625
Administration	2,350	2,350	4,100	4,100	3,225
TOTAL	57,000	59,000	94,000	90,000	75,000

The figures are smoothed on the basis of individual allocations.

11.2.3 Individual calculation, making no distinction between normal teaching service and additional teaching service

	Lecturer A	Lecturer B	Lecturer C	Lecturer D	Smoothed
Semester of teaching	16,450	8,980	28,700	16,350	15,431
Research	21,750	11,750	32,500	20,500	21,625
Administration	2,350	2,350	4,100	4,100	3,225
TOTAL	57,000	59,000	94,000	90,000	75,000

The smoothed figures are of course exactly as in the previous case. These two solutions are not advocated for inter-university comparisons as smoothing would lead to different results from those obtained by division into categories or groups.

11.2.4 Individual calculation based on global undifferentiated salaries

	Lecturer A	Lecturer B	Lecturer C	Lecturer D	Smoothed
Semester of teaching	19,950	8,260	32,900	15,750	16,154
Research	14,250	14,750	23,500	22,500	18,750
Administration	2,850	2,950	4,700	4,500	3,750
TOTAL	57,000	59,000	94,000	90,000	75,000

The result of the smoothing process is of course exactly as in the following solution:

11.2.5 Calculation by categories

Average salary: $(57,000 + 59,000 + 94,000 + 90,000) \times \frac{1}{4} - 75,000$

Average number of semesters of teaching: $\frac{13}{4} = 3.25$

Average cost per semester: $75,000 \times \frac{70}{100} \times \frac{1}{3.25} = 16,154$

Average cost of research per teacher: $75,000 \times \frac{25}{100} = 18,750$

Average cost of administration per teacher: $75,000 \times \frac{5}{100} = 3,750$

As this calculation is a form of smoothing, assignment is the same for retrospective costs as for smoothed costs.

11.3 Numerical example for a EEAE

Course X_1: semester course with supervised work sessions.

Number of students forecast before the beginning of the university year:	600
Number of students registered (registration for courses):	360
Theoretical size of a supervised work group:	25

Actual number of groups: 20
Formal lectures: actual cost assigned: 32,900
(Lecturer A, normal teaching service) smoothed cost of one course: 30,862
(solution 11.2.2)

Supervised work sessions: two full-time assistants in charge of planning and responsible for six groups, fourteen groups being run by outside teachers.

Smoothed cost per hour of supervised work: Frs.100
Material facilities: amphitheatre with seating for 1,000 (instead of 500) owing to a forecasting error (the university is assumed to be over-occupied).
Documentary brochure, 80 pages, 700 copies (norm = number of students plus 10 per cent).

The example in the following Table describes the utilisation of the smoothed costs calculated for an internal budget management objective in the strictest sense of the word. A broader comparison would have been possible by basing the smoothing procedure on the anticipated figure of 600 students, but would have been meaningless except in terms of unit costs.

The inter-university comparisons using smoothed costs based on real physical elements but average input prices will be more revealing than comparisons based on retrospective costs. Indeed, the anomalies which are specific to a given UEA will be evened out by the calculation of averages.

Comparison of retrospective and smoothed costs

	Retrospective	Smoothed	Comments
1. **Staff costs**:			
- **lecturing**	32,900	30,862	Average
- **supervised work sessions**			number of
staff: Mr. Duval (in charge of planning)	10,000		students 18 instead of
Mr. Dumont	7,200		25 low
staff in charge of supervised			teacher/
work sessions: 14 groups,			student rate
16½ hrs. at Frs.72 per hour	16,632		
Total retrospective cost of supervised work sessions	33,832		
Smoothed supervised work sessions			
$\frac{360}{25}$ + 2 (planning staff) = 17 groups,			
16½ hrs. Frs.100		28,050	
Total staff costs	66,732	58,912	
2. **Premises**			
Amphitheatre, 1,000 places, 39 hrs.	5,196		3,000 sq.
Amphitheatre, 500 places,			metres, height
37½ hrs.		2,080	coefficient: 2
Classrooms for supervised work			1,800 sq.
sessions:			metres, height
20 x 16½ hrs. at 1.03	340		coefficient: 1.5
15 x 16½ hrs. at 1.03		255	
Meetings:			
12 hrs. at 1.03	12		
10 hrs. at 1.03		10	
	5,548	2,345	
3. **Document - copying service**			
80 x 700 x 0.1938	10,853		too many copies
80 (360 + 10%.360) x 0.1938		6,140	made owing to an error in forecasting the number of students in June
4. etc.			

CHAPTER 12

FINDING THE UEA COST FUNCTIONS

As a preparation for the statistical analysis of UEA cost functions and particularly the task of finding variables which will explain the semi-direct global costs of the UEAs data will have to be classified in groups which obey the same principles.

Although in the short-term (budget management with an unchanged structure) the significant variable is the unit of measurement of activity, this is not the case in the long-term where all input factors are explanatory as their combination is no longer considered constant.

12.1 What UEA cost should be adopted for an analysis of variation?

Two approaches may be considered in this investigation:

- a logical analytical approach;
- a global statistical approach.

In both cases the investigation is possible only in a field where the cost-activity relationship is meaningful. It follows that cost elements which depend on arbitrary or chance factors do not lend themselves to analysis, whether they are logical or statistical.

There are consequently two requirements for the calculation of the UEA cost:

(1) Elimination of arbitrary absorption

All cost elements absorbed by the use of empirical apportionment criteria must be eliminated from the field of the investigation as their scale does not depend on the level of the activity of the UEA. It therefore follows that the field of study, in cost terms, will merely include:

- directly assigned costs which have a clear connection with the existence of the UEA;
- semi-direct costs, or costs of measurable services representing real invoiced consumption (somewhat vitiated by the arbitrariness of the price element).

(2) Elimination of anomalies

Subject to these restrictions we have two types of costs:

- retrospective costs which accurately reflect the real conditions under which the UEA in question operates, with all their anomalies and hazards;

- smoothed costs where the operating conditions reflected are averages based on presumably normal operations. If these averages are calculated from a sufficiently small group to avoid smoothing normal differences (examples: it may be considered normal for a number of years that the lecturing staff of an economic science UER should have more seniority than the staff of a management UER and that the staff of mathematical departments should have other types of recruitment and consequently remuneration than the staff of history departments), it would seem that they define a cost which is statistically and logically more meaningful than a cost calculated by allowing for all anomalies arising in an actual situation.

For this reason it is proposed that the reference cost for the analysis of variations should be the smoothed direct and semi-direct UEA cost.

12.2 Time-series analysis

There are a few universities which at present have the same structure as when they were faculties and can therefore envisage historical statistical analyses. This approach is required for the analysis of physical flows (student intakes, for example) but involves considerable difficulty when the problem is to discover explanatory cost variables:

(1) the price system is not stable over time and the analysis can only be carried out in constant currency, which calls for the use of appropriate deflators.

In the French case three price indices may be used:

- the general index of public service salaries issued by INSEE (1962 = 100). This will be used to deflate staff costs;

- the GNP price index. This will be used to deflate operating initial equipment and transfer costs;

- the weighted Department index (adjustment coefficient for building prices in a particular Department of France). This will be used to deflate capital costs (premises).

(2) Records are not always kept of the physical level of input consumption

Two types of documents may be consulted:

- accounting records relating to the university and UER accounts and also to the Ministry's accounts (staff);

- teaching records: courses provided (nature of course, place, teacher, number of students...).

The first category of records is available over a long period but the teaching records are very rarely kept. There will consequently be considerable errors in the assignment of costs to intermediate activities and outputs.

(3) Output systems are constantly changing and this is particularly true of teaching methods. Here the modifications seem very small at first-sight but have no little effect on the resources utilised.

But this historical statistical investigation of the principles governing cost variations can hardly be carried out except by multiple regression and this implies:

- long series (10 years seems a minimum);

- data which are precise and perfectly comparable to avoid the introduction of adjustment bias.

As it therefore seems difficult to obtain meaningful results by this method it should be possible to consider the use of cross-section analysis the advantage of which is to stabilize the productive combinations as far as time and price distortions are concerned.

12.3 Cross-section analysis

In the absence of a time-series analysis or in support of a study of this kind, the data for a single university year may conceivably be used to obtain additional information regarding the variables of the different types of cost in relation to certain other variables, i.e. number of students per UEAE, number of students per supervised work group, number of hours of teaching or hours of supervised work. All these are decision variables which may be more or less rapidly modified and their effect on the unit cost trend is important to ascertain.

The objective would be to work out empirical cost functions. If such functions are to be meaningful we feel that they must undoubtedly apply to teaching processes which are sufficiently related or even identical. The UEAEs should not therefore differ except as regards the figures for the variables we have listed above (number of students, etc...). A number of homogeneous UEAE sub-groups can be formed: for example, SEHUEAEs covering for example, all UEAEs in the same cycle, in the same UER and more generally of the same type (e.g. formal lecture accompanied by supervised work, language classes for small groups with laboratory sessions, etc). These categories may be formed from subdivisions which already exist e.g. those referred to above, but more sophisticated methods may be considered (different segmentation processes, etc). Once these categories have been established, the method used would be multiple regression of cross section data using an endogenous variable (total cost of the UEAE, unit cost and various kinds of costs using the exogenous variables we have already mentioned). These relationships should not only highlight economies of scale resulting from the presence of a large number of students in certain UEAEs but also reveal the sensitivity of costs to such variables as the length of a course or the ratio of supervised work sessions to formal lectures. It is, however, obvious that the greatest caution must be exercised in using all the results obtained on these functions of costs, so long as there is no means of testing the "quality" of the output (knowledge acquired in the context of a UEAE).

GLOSSARY

Activity

Organisation of resources in a technological process designed to contribute to the production of an output (or several outputs) or a service (or several services).

Administrative activity

Indirectly productive activity whose outputs are administrative services and cannot be measured.

Miscellaneous activities

Directly or indirectly productive activities which cannot be classified in the chart adopted, either because their objective is not covered by the basic definitions or because the information available does not enable their level of activity or their output to be measured (see miscellaneous UEAs).

Service activity

Indirectly productive activity whose outputs and whose consumption by the user UEAs (see this term) are measured quantitatively.

Directly productive activity

(see page 54)

Activity designed to contribute to the production of a final output (or several final outputs).

Indirectly productive activity

(see page 54)

Activity designed to contribute to the production of an intermidiate output (or several intermediate outputs) or a service (or several services) for the use of other UEAs (see this term) of the agent concerned.

Direct assignment

Accounting operation which consists in assigning to a cost account the charges directly relating to that account.

Time-series approach

This approach analyses the trend of a set of data over several successive periods (e.g. in respect of costs, enrolments, etc...). The reconstitution of a recent trend may enable a more reliable forecast to be made by extrapolation than might be possible by cross-section analysis.

Cross-sectional approach

This approach is concerned with only one period; if certain precautions are taken, it is possible to restore a certain dynamic content to the conclusions drawn from a cross-section analysis.

Group (of staff)

A more detailed classification of staff than by category. For example the category of teaching staff may be sub-divided into three groups: first group: professors, maîtres de conférences (senior lecturers) and chargés d'enseignement (lecturers); second group: maîtres-assistants (junior lecturers); third group: assistants. Within each group there is normally a certain homogeneity based on status and/or the service required from the staff concerned.

Cost centre

(see page 54)

"Division of an enterprise considered as the subject of a special grouping of charges or costs." (P. Lauzel - Comptabilité analytique - Sirey 1971).

Fictitious cost centre

Simple group of charges identical in nature but not reflecting a physical division in the economic agent concerned.

Real cost centre

Real division of the university (service or group of services) to which it is possible to allocate the charges relating to their operation.

Employer's salary-related charges

Social and fiscal charges which are due from an employer and are expressed, according to complex procedures, as a function of certain elements in the remuneration of the employee (see basic salary).

Intake

Set of students defined by the fact that they have initially experienced the same event at the same date (e.g. registration for the first time in the first year of a first cycle in 1970-71). An intake is studied by following the history of the set of students as from the event in question.

Commitment accounting

System of accounts where a charge is registered as soon as an order is booked as distinguished from payment accounting where the charge is registered on receipt of the invoice.

Cost

"A cost is the expression in monetary terms of the consumption of one or more operating resources." (P. Lauzel - Comptabilité analytique - Sirey 1971). The term "opportunity cost" (q.v.) goes beyond the accountancy concept of costs in that it is the expression in monetary terms of a decision not to use for some other purpose an operating resource allocated to the university.

Incremental cost

Cost increase resulting from the increase in a production run or in the activity of a UEA. It includes the extra structural charges which may be necessary but excludes any change in technology.

Accounting cost

Cost calculated from all the items described by the accounting system used by the economic agent concerned, and only these items.

For example: in the context of a university the accounting cost is limited to the items in the operational budget; in the context of the French educational system it also includes all staff costs but excludes capital costs as the patrimonial accounts are not kept.

Direct cost

Set of items which can be assigned (see assignment) with absolute certainty to a unit of activity or production as these items represent a known consumption of inputs by that unit.

Economic cost (or opportunity cost in the widest sense)

Cost resulting from a given economic activity whether or not the items in the calculation are provided by the accounting system. The difference between economic costs and accounting costs consists of:

- implicit costs: or costs resulting from actual consumption by the agent whose economic activity is described although the consumption is not explicitly shown in the accounting system the agent uses;
- opportunity costs in the strict sense.

Operating costs

The term is used here in a narrow sense: it excludes staff costs which are sometimes shown under this heading. These costs are largely financed from the university budget.

Global cost of an elementary unit of activity (UEA)

Set of semi-direct and indirect costs charged to this UEA after the assignment and apportionment operations.

Indirect cost

Set of cost items apportioned (see apportionment) from the indirectly productive units to the directly productive units.

Marginal cost

Cost of the production of one additional unit (marginal production cost) or cost of the application of one additional unit of activity (marginal activity cost). In the short-term (invariable structures) and on the assumption of a linear variation in charges, the marginal cost is identical to the average variable cost. In the long-term (variable structures), the marginal cost is equated with the derivative of the cost function (if it is known) in relation to the quantity of output or the quantity of activity. If the structures are rigid a distinction may be made between a marginal development cost and a marginal regression cost.

Nominative cost (As opposed to a positive cost)

Cost resulting from the use of an optimum combination of inputs in the manufacture of a given output. The normative cost can therefore only be calculated at the conclusion of an optimisation process. The term "standard cost", used in accounting, is intermediate between positive cost and normative cost. In a given process (with a fixed input utilisation ratio) it is the cost resulting from the total elimination of spoilage. There is consequently a standard cost for each process. For a given level of production the optimum (minimum) standard cost is therefore the normative cost.

Positive cost (As opposed to normative cost)

Cost describing or estimating a real situation. In the context of this study, a distinction will be made between:

- **real positive costs**: describing the actual consumption of inputs, evaluated at their real price, by the production unit concerned;
- **"smoothed" positive costs**: describing the average actual consumption of inputs (evaluated at their average price) of a set of production units with common characteristics.

Ex-ante cost

Cost calculated beforehand from forecasts.

Real cost

Cost calculated historically by using real quantities and values. The term real is not used here, as in economic terminology, in opposition to nominal but in opposition to ex-ante cost (q.v.).

Opportunity cost

"In the last analysis, the real cost of anything is what has to be forgone in order to have it. Hence the real cost of higher education is what could have been produced or enjoyed had the means involved - the use of buildings and materials, the services of staff and students - been available for other purposes... The ultimate cost of higher education is what is forgone by devoting resources, including the potential earnings of students, to this purpose rather than to something else..."

U.K. Committee on Higher Education, Higher Education, Cmnd 2154 (The Robbins Report) HMSO 196.

Semi-direct cost

(This concept does not exist in traditional accounting theory).

In this study the semi-direct cost of an elementary unit of activity is the sum of its direct costs and the semi-direct cost of the measurable and measured services it has actually consumed.

Standard cost

Ex-ante cost estimated from items which are valid as standards and with which the items used to calculate real costs will be compared.

Transfer costs

Direct and indirect aid granted by the state or other public authorities to the student and/or his family (scholarships, tax reliefs...).

Unit activity cost

Global cost of a UEA divided by the number of units of activity provided during the period under review. This cost may be complete or partial and divided into fixed and variable costs. It may also be average, marginal or incremental (q.v.).

Degree with a year structure

The courses leading up to this degree are organised at different levels. The levels are independent as regards proficiency control. A student normally remains at each level for a year and if his proficiency is confirmed he is promoted to the next higher level.

Degree with a credit structure

A student is not obliged to study a series of subjects in strict sequence as in the case of degrees with a year structure. According to the degree he is working for, he acquires a number of credits which are either freely selected or partly compulsory and/or taken in strict sequence. For each credit there is a separate proficiency test and students who pass a number of these tests successfully are awarded the degree.

Curriculum

Set of credits which students are required to obtain for the award of a degree. For one and the same degree there is often a very wide range of possible curricula owing to the numerous choices and options frequently available.

Grade (staff)

Group of employees with an identical status. Administrative nomenclature covers a very large number of grades (example: professor, assistant, grade 1B technician, etc...).

Absorption

Accounting operation which consists of assigning the costs of directly productive UEAs to the output cost accounts in proportion to the consumption of activity indices (units of activity measurement).

Rational absorption of fixed charges

Extension of the method of homogeneous sections based on the distinction between fixed charges and charges proportionate to the level of activity in each section; the rational cost of the activity index (see this term) is calculated solely from the fraction of fixed charges proportionate to the level of activity (ratio of real activity to normal activity).

$$C_{ratio} = v + \frac{F}{a_n} , \text{ real } C = v + \frac{F}{a_r}$$

It therefore tends to be the cost of the full utilisation of the section. The absorption of that cost in the output accounts enables output costs to be calculated in a situation of full utilisation.

Option

Set of specialised credits among which students make a certain number of regulated choices with a view to obtaining a degree mentioning their special subject (e.g. degree in economic science, special subject: econometrics). Not all optional subjects lead to a specialised degree under existing regulations. This can be awarded only in subjects approved by the Ministry of Education.

Services (self-consumed)

This term is used to describe the situation in which an indirectly productive homogeneous section (or UEA) consumes part of its own production in order to operate. This factor is generally overlooked in traditional accounting methods but may be allowed for by the use of algebraic methods (see page 83)

Reciprocal services

This term is used to describe a situation in which two indirectly productive homogeneous sections (or UEAs) provide each other with reciprocal services. In the apportionment procedure (see this term) the result is that the cost of each section concerned includes a proportion of the cost of the other section and that algebraic methods are generally used (see pages

Output

Item of goods or services resulting from the combination of production inputs in a process.

Final output (or finished output)

Output designed to be offered on the market (whether or not organised) to an economic agent other than the producer.

Intermediate output

Output designed to be consumed by a unit of the economic agent concerned.

Joint outputs (often: joint products)

Different outputs obtained at the conclusion of the same manufacturing process. The following terms are used:

- joint outputs: when the different outputs obtained are of comparable economic importance;
- principal output and sub-output (or by-product): when the two types of output are marketable but one has greater economic importance than the other;
- principal output and spoilage: when the second type is not marketable.

Output awaiting allocation

An output which at the time of the analysis has not completed the manufacturing cycle so that it is uncertain whether:

- it will continue through the cycle to become an intermediate output;
- or whether the manufacturing process will be stopped at that point and the output will leave the system in its present state as a final output.

Indexed remuneration

The various components of the salary paid to French public servants and determined by the official salary index.

Principal remuneration

Remuneration paid to each employee for the time spent in performing his normal service (see normal service).

Apportionment (or provation)

"Sorting process enabling cost components which cannot be directly assigned to cost accounts to be re-classified in charge or section accounts". (Plan Comptable Général Français 1957).

In university cost accounting the terms "apportionment" or "proration" are limited to the allocation of the costs of indirectly productive UEAs to the accounts of the UEAs which benefit from their activity.

Homogeneous section

"Real or fictitious group of charges formed to enable the total charges comprised to be expressed in terms of a common unit facilitating verification and subsequent assignment". (A. Rapin et J. Poly - Comptabilité analytique d'exploitation - Dunod 1972).

A homogeneous section must therefore have the following characteristics:

(1) Activity Centre: for a real portion of the enterprise activity must be homogeneous and measurable by an "activity index" (q.v.).

(2) Cost Centre: see this term

(3) Responsibility Centre: in budget management a homogenous section must be placed under a single responsible authority.

Normal service (of an employee)

Service rendered in return for the principal remuneration. If the service exceeds the remuneration it generally carries additional remuneration.

Basic salary

This covers the components of the employee's remuneration which are used as a basis for calculating the salary-related charges. The number of components varies according to the status of the employee (whether or not established).

Elementary unit of activity (UEA)

(see page 53)

Utilisation of the smallest set of resources co-ordinated in a process designed to produce final or intermediate output or service (or several final or intermediate outputs or services).

Elementary unit of administrative activity (UEAA)

Utilisation of the smallest set of resources co-ordinated in a process designed to produce an administrative service (or several administrative services).

Elementary unit of miscellaneous activities (UEAD)

Utilisation of the smallest set of resources co-ordinated in a process designed to produce an output or a service (or several outputs or services) which are not classifiable in one of the four preceding categories.

Elementary unit of teaching activity (UEAE)

(see page 56)

Utilisation of the smallest set of resources co-ordinated in a process designed to convert students at one level of knowledge into students at a higher level of knowledge, the acquisition of the additional knowledge being normally verified by an institutionalised proficiency test.

Elementary unit of service activity (UEAPS)

(see page 57)

Utilisation of the smallest set of resources co-ordinated in a process designed to produce an essentially intermediate item of goods or services or a set of essentially intermediate goods or services with significant common characteristics. The item of goods, the service or the set of goods or services must have a physical unit of measurement and the services to each UEA must be measurable.

Elementary unit of research activity (UEAR)

(see page 57)

Utilisation for a unit of time (the university year) of the smallest set of resources which can be considered as a cost centre in order to create new knowledge.

Unit of education and research (UER)

A new division which emerged from the university reform of 1968. It may be defined as an organised group of human and material resources generally designed to perform certain types of training and/or certain research. The university may create, alter or abolish these structures as its programme proceeds. In our terminology the UER is a non-elementary unit of activity (see this term and see page 54).

Activity index

(see page 67 et seq.)

"Unit used to measure and to assign to each of the costs concerned the proportion of charges (of the section) which actually relates to it." (Plan Comptable Général Français 1957).

For present purposes the activity index is the unit of measurement of the level of activity of the UEA concerned.

Credit

Term normally reserved for the subjects studied for degrees with a credit structure (q.v.). A credit is usually treated as an independent portion of a degree for purposes of proficiency control. However, in certain universities the term is used in the English sense as an indication of the comparative importance of a subject in a curriculum or even a unit (e.g.: a semester of English philology; a year's course of industrial ergonomics).

Non-elementary unit of activity (UNEA)

(see page 54)

Each sub-set of elementary units of activity (q.v.) as defined with reference to a criterion of classification.